



STIC Search Report

EIC 1700

STIC Database Tracking Number: 161804

TO: Raymond Alejandro
Location: Rem 6B59
Art Unit : 1745
August 18, 2005

Case Serial Number: 09/891200

From: Les Henderson
Location: EIC 1700
REM 4B28 / 4A30
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Search Notes

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(FILE 'HOME' ENTERED AT 08:26:50 ON 17 AUG 2005)

FILE 'HCAPLUS' ENTERED AT 08:27:35 ON 17 AUG 2005

E US20020031695/PN

L1 1 SEA ABB=ON PLU=ON US20020031695/PN
D ALL
SEL L1 RN

FILE 'REGISTRY' ENTERED AT 08:31:04 ON 17 AUG 2005

L2 14 SEA ABB=ON PLU=ON (12023-04-0/BI OR 12196-72-4/BI OR
1333-74-0/BI OR 153328-13-3/BI OR 18649-05-3/BI OR
191980-68-4/BI OR 251566-28-6/BI OR 395656-87-8/BI OR
395656-88-9/BI OR 67-56-1/BI OR 7440-02-0/BI OR 7440-05-3
/BI OR 7440-32-6/BI OR 7440-62-2/BI)
D SCAN
E 1333-74-0/RN
L3 1 SEA ABB=ON PLU=ON 1333-74-0/RN
D SCAN
E 67-56-1/RN
L4 1 SEA ABB=ON PLU=ON 67-56-1/RN
D SCAN
E 7440-05-3/RN
L5 1 SEA ABB=ON PLU=ON 7440-05-3/RN
D SCAN
E 7440-32-6/RN
L6 1 SEA ABB=ON PLU=ON 7440-32-6/RN
D SCAN
E SILVER/CN
L7 1 SEA ABB=ON PLU=ON SILVER/CN
D RN
E 7440-22-4/RN
L8 1 SEA ABB=ON PLU=ON 7440-22-4/RN
D SCAN
E COPPER/CN
L9 1 SEA ABB=ON PLU=ON COPPER/CN
D RN
E 7440-50-8/RN
L*** DEL 1 S 7440-50-8/RN
D SCAN
E 7440-62-2/RN
L11 1 SEA ABB=ON PLU=ON 7440-62-2/RN
D SCAN
E LANTHANUM/CN
L12 1 SEA ABB=ON PLU=ON LANTHANUM/CN
D SCAN
D RN
E 7439-91-0/RN
L13 1 SEA ABB=ON PLU=ON 7439-91-0/RN
D SCAN
E 7440-02-0/RN
L14 1 SEA ABB=ON PLU=ON 7440-02-0/RN
D SCAN
E IRON/CN
L15 1 SEA ABB=ON PLU=ON IRON/CN
D RN
E 7439-89-6/RN
L16 1 SEA ABB=ON PLU=ON 7439-89-6/RN
D SCAN
E CHROMIUM/CN
L17 1 SEA ABB=ON PLU=ON CHROMIUM/CN
D RN
E 7440-47-3/RN
L18 1 SEA ABB=ON PLU=ON 7440-47-3/RN
D SCAN

		D SCAN L2	
		E 12023-04-0/RN	
L19	1	SEA ABB=ON PLU=ON	12023-04-0/RN
		D SCAN	
		E AGPD/MF	
L20	1	SEA ABB=ON PLU=ON	AGPD/MF
		D SCAN	
		D RN	
		E 60495-83-2/RN	
L21	1	SEA ABB=ON PLU=ON	60495-83-2/RN
L22	366	SEA ABB=ON PLU=ON	(AG(L) PD) /ELS (L) 2/ELC . SUB
		E CUPD/MF	
L23	2	SEA ABB=ON PLU=ON	CUPD/MF
		D SCAN	
		D 1-2 RN	
L24	1	SEA ABB=ON PLU=ON	849794-14-5/RN
		D SCAN	
L25	1	SEA ABB=ON PLU=ON	12381-74-7/RN
		D SCAN	
L26	265	SEA ABB=ON PLU=ON	(CU(L) PD) /ELS (L) 2/ELC . SUB
		E LANI5/MF	
L27	1	SEA ABB=ON PLU=ON	LANI5/MF
		D SCAN	
		E CRV2/MF	
		E CRV/MF	
L28	4	SEA ABB=ON PLU=ON	CRV/MF
		D SCAN	
		E CRV2/MF	
		E V2CR/MF	
L29	28	SEA ABB=ON PLU=ON	34 CR/MAC AND 66 V/MAC
L30	10	SEA ABB=ON PLU=ON	L29 AND 2/NC
L31	149	SEA ABB=ON PLU=ON	(CR(L) V) /ELS (L) 2/ELC . SUB
L32	209	SEA ABB=ON PLU=ON	(NI (L) TI (L) V) /ELS (L) 3/ELC . SUB
L33	213	SEA ABB=ON PLU=ON	(NI (L) V) /ELS (L) 2/ELC . SUB
L34	310	SEA ABB=ON PLU=ON	(TI (L) V) /ELS (L) 2/ELC . SUB
L35	6	SEA ABB=ON PLU=ON	(BA (L) CA (L) H (L) NB (L) O) /ELS (L) 5/ELC . SU
		B	
		D SCAN	
L36	5	SEA ABB=ON PLU=ON	L35 AND H2O
L37	1	SEA ABB=ON PLU=ON	L35 NOT L36
		D SCAN	
L38	43	SEA ABB=ON PLU=ON	(BA (L) CA (L) NB (L) O) /ELS (L) 4/ELC . SUB
L39	42	SEA ABB=ON PLU=ON	(CS (L) H (L) S (L) O) /ELS (L) 4/ELC . SUB
L40	13	SEA ABB=ON PLU=ON	L39 AND H2O
L41	3	SEA ABB=ON PLU=ON	(CS (L) S (L) O) /ELS (L) 3/ELC . SUB
		D SCAN	
		D SCAN L40	
L42	6	SEA ABB=ON PLU=ON	L39 AND SO4
		D SCAN	
		E CS5H3(SO4)4	
		E CS5H3(SO4)4/MF	
		E CS5H4O16.5S16/MF	
		E SNCL2/MF	
		E CL2SN/MF	
L43	10	SEA ABB=ON PLU=ON	CL2SN/MF
		D SCAN	
L44	91	SEA ABB=ON PLU=ON	(SN(L) CL(L) H(L) O) /ELS (L) 4/ELC . SUB
		E TIN CHLORIDE HYDRATE/CN	
L45	38	SEA ABB=ON PLU=ON	L44 AND H2O
L46	14	SEA ABB=ON PLU=ON	(AG (L) I (L) W (L) O) /ELS (L) 4/ELC . SUB
		E H2KO4P/MF	
L47	33	SEA ABB=ON PLU=ON	H2KO4P/MF
		E TETRAAMMONIUM DIHYDROGEN TRISELENATE/CN	
L48	52	SEA ABB=ON PLU=ON	(N(L) H(L) SE(L) O) /ELS (L) 4/ELC . SUB
		E CSDO4S/MF	
L49	8	SEA ABB=ON PLU=ON	(CS (L) D (L) S (L) O) /ELS (L) 4/ELC . SUB

D SCAN
 L50 55 SEA ABB=ON PLU=ON (CS(L)H(L)P(L)O)/ELS(L)4/ELC.SUB
 L51 2 SEA ABB=ON PLU=ON L49 AND SO4
 D SCAN
 L52 1 SEA ABB=ON PLU=ON L50 AND PO4
 D SCAN
 L53 23 SEA ABB=ON PLU=ON (SR(L)ZR(L)Y(L)O)/ELS(L)4/ELC.SUB
 L54 15 SEA ABB=ON PLU=ON (SI(L)N(L)H(L)O(L)P)/ELS(L)5/ELC.SUB

 D SCAN
 L55 33454 SEA ABB=ON PLU=ON (SI(L)O(L)P)/ELS
 L56 60 SEA ABB=ON PLU=ON L55 AND AMMONIUM
 L57 13 SEA ABB=ON PLU=ON L56 AND PHOSPHATE
 D SCAN
 L58 5 SEA ABB=ON PLU=ON L57 AND (SILICON OR SILICA OR
 SILICATE)
 D SCAN
 E SILICA/CRN
 E SILICA/RN
 E SILICA/CN
 L59 1 SEA ABB=ON PLU=ON SILICA/CN
 D RN
 L60 2201 SEA ABB=ON PLU=ON 7631-86-9/CRN
 E POLYPHOSPHATE/CN
 E PHOSPHATE/CN
 L61 1 SEA ABB=ON PLU=ON PHOSPHATE/CN
 D SCAN
 D RN
 L62 14061 SEA ABB=ON PLU=ON 14265-44-2/CRN
 E AMMONIUM/CN
 L63 1 SEA ABB=ON PLU=ON AMMONIUM/CN
 D SCAN
 D RN
 L64 2837 SEA ABB=ON PLU=ON 14798-03-9/CRN
 L65 0 SEA ABB=ON PLU=ON L60 AND L62 AND L64
 L66 2 SEA ABB=ON PLU=ON (LA(L)SR(L)SC(L)O(L)MG)/ELS(L)5/ELC.S
 UB
 D SCAN
 L67 64 SEA ABB=ON PLU=ON (BA(L)CE(L)ZR(L)O(L)(GD OR ND))/ELS(L)
)5/ELC.SUB
 E ZIRCONIUM PHOSPHATE PYROPHOSPHATE/CN
 L68 26 SEA ABB=ON PLU=ON (ZR(L)P(L)O)/ELS(L)3/ELC.SUB
 L69 1 SEA ABB=ON PLU=ON L68 AND PYROPHOSPHATE
 D SCAN
 L70 0 SEA ABB=ON PLU=ON L68 AND MESOPOROUS
 L71 1 SEA ABB=ON PLU=ON L68 AND P2O7
 D SCAN
 L72 1 SEA ABB=ON PLU=ON L69 OR L71

FILE 'HCAPLUS' ENTERED AT 11:10:18 ON 17 AUG 2005

E FUEL CELLS/CT
 E E3+ALL
 L73 89636 SEA ABB=ON PLU=ON FUELCELL? OR FUEL?(2A)CELL? OR FC OR
 SOFC OR DFC OR PEMFC
 E ELECTROLYTE/CT
 E E3+ALL
 E ELECTROLYTES/CT
 E E3+ALL
 L74 3685 SEA ABB=ON PLU=ON ("FUEL CELL ELECTROLYTES"/CT OR
 "FUEL-CELL ELECTROLYTES"/CT)
 L75 3535795 SEA ABB=ON PLU=ON ELECTROLYT? OR ELECTRO(A)LYT? OR
 SALT? OR ION? OR CATION? OR ANION? OR COUNTERION? OR
 COUNTER(A)ION?
 L76 25758 SEA ABB=ON PLU=ON L73(L)L75
 L77 25758 SEA ABB=ON PLU=ON L74 OR L76
 E SUPPORT/CT


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      E E3+ALL
      E SUPPORTS/CT
      E E3+ALL
L78    10663 SEA ABB=ON  PLU=ON  METAL? (A) SUPPORT?
L79      22 SEA ABB=ON  PLU=ON  (METAL? (A) HYDRID?) (2A) SUPPORT?
L80      28 SEA ABB=ON  PLU=ON  (METAL? (A) HYDRID?) (3A) SUPPORT?
L81      1 SEA ABB=ON  PLU=ON  L80 AND L77
      D SCAN
L82      78 SEA ABB=ON  PLU=ON  L78 AND L77
L83    10591 SEA ABB=ON  PLU=ON  METAL? (A) HYDRID?
L84      91 SEA ABB=ON  PLU=ON  L83 AND L77
L85    7974 SEA ABB=ON  PLU=ON  (ELECTRON# OR HOLE# OR CHARGE#) (2A) IN
      SULAT?
      E PROTON/CT
      E PROTONS/CT
L86    49586 SEA ABB=ON  PLU=ON  (PROTON? OR HYDROGEN? OR H) (A) (CONDUCT?
      OR TRANSFER? OR FLUX?)
L87      QUE ABB=ON  PLU=ON  FILM? OR THINFILM? OR LAYER? OR
      OVERLAY? OR OVERLAID? OR SHEET? OR COAT? OR TOPCOAT? OR
      OVERCOAT? OR SHEATH? OR COVER? OR ENVELOP? OR ENCASE? OR
      ENWRAP? OR OVERSPREAD?
L88      0 SEA ABB=ON  PLU=ON  (L85 (3A) L86) (4A) L87
L89      2 SEA ABB=ON  PLU=ON  L85 (3A) L86
      D SCAN
L90      1 SEA ABB=ON  PLU=ON  (L85 (L) L86) (L) L87
      D SCAN
L91      1 SEA ABB=ON  PLU=ON  L85 AND L86 AND L87
      D SCAN
L92      79 SEA ABB=ON  PLU=ON  (L82 OR L80) AND L77
L93     168 SEA ABB=ON  PLU=ON  L92 OR L84
L94    2735 SEA ABB=ON  PLU=ON  L85 (3A) L87
L95     832 SEA ABB=ON  PLU=ON  L86 (3A) L87
L96      0 SEA ABB=ON  PLU=ON  L93 AND L94
L97      2 SEA ABB=ON  PLU=ON  L93 AND L95
      D SCAN
L98      0 SEA ABB=ON  PLU=ON  L94 AND L95
      D QUE L75
      D QUE L93
L99      67 SEA ABB=ON  PLU=ON  L93 AND L87
L100    170 SEA ABB=ON  PLU=ON  AREA (2A) SPECIF? (2A) RESISTAN?
L101      0 SEA ABB=ON  PLU=ON  L99 AND L100
L102      0 SEA ABB=ON  PLU=ON  L100 AND L93
L103     40 SEA ABB=ON  PLU=ON  L100 AND L77
      D L103 1-10 KWIC
L104    6827 SEA ABB=ON  PLU=ON  OHM? (A) CM?
L105     43 SEA ABB=ON  PLU=ON  L104 AND L77
L106      0 SEA ABB=ON  PLU=ON  L104 AND L99
L107      0 SEA ABB=ON  PLU=ON  L104 AND L93
L108     83 SEA ABB=ON  PLU=ON  L103 OR L105
L109      0 SEA ABB=ON  PLU=ON  L108 AND L83
L110      0 SEA ABB=ON  PLU=ON  L108 AND L80
      D QUE
L111      0 SEA ABB=ON  PLU=ON  L108 AND L78
L112     16 SEA ABB=ON  PLU=ON  L108 AND SUPPORT?
L113     33 SEA ABB=ON  PLU=ON  L108 AND L87
L114      9 SEA ABB=ON  PLU=ON  L112 AND L87
      D SCAN
L115      0 SEA ABB=ON  PLU=ON  L112 AND (L85 OR L86)
L116      0 SEA ABB=ON  PLU=ON  L113 AND (L85 OR L86)
L117      QUE ABB=ON  PLU=ON  CENTIGRAD? OR CELCIUS? OR DEG? (A) C
L118      1 SEA ABB=ON  PLU=ON  L117 AND L113
      D SCAN
L119      2 SEA ABB=ON  PLU=ON  L117 AND L112
L120      1 SEA ABB=ON  PLU=ON  L117 AND L114
L121      2 SEA ABB=ON  PLU=ON  (L118 OR L119 OR L120)
      D SCAN

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FILE 'HCAPLUS' ENTERED AT 13:29:41 ON 17 AUG 2005

L122 301584 SEA ABB=ON PLU=ON L3
 L123 33628 SEA ABB=ON PLU=ON L3/P
 L124 6045 SEA ABB=ON PLU=ON (L122 OR HYDROGEN OR H2 OR H) (L) L77
 L125 21754 SEA ABB=ON PLU=ON (L122 OR HYDROGEN OR H2 OR H) (L) L73
 L126 127675 SEA ABB=ON PLU=ON L4
 L127 474526 SEA ABB=ON PLU=ON L126 OR METHANOL? OR CH3OH OR MEOH
 OR METHY(A) ALCOHOL?
 L128 87588 SEA ABB=ON PLU=ON L5
 L129 238514 SEA ABB=ON PLU=ON L128 OR PALLADIUM? OR PD
 L130 155473 SEA ABB=ON PLU=ON L6
 L131 579372 SEA ABB=ON PLU=ON L130 OR TITANIUM OR TI
 L132 163618 SEA ABB=ON PLU=ON L8
 L133 950 SEA ABB=ON PLU=ON L129 AND L77
 L134 902 SEA ABB=ON PLU=ON L131 AND L77
 L135 1063 SEA ABB=ON PLU=ON (L8 OR SILVER OR AG) AND L77
 L136 489861 SEA ABB=ON PLU=ON L***

FILE 'REGISTRY' ENTERED AT 13:57:52 ON 17 AUG 2005

E 7740-50-8/RN

E 7440-50-8/RN

L137 1 SEA ABB=ON PLU=ON 7440-50-8/RN
 D SCAN

FILE 'HCAPLUS' ENTERED AT 13:58:57 ON 17 AUG 2005

L138 1082 SEA ABB=ON PLU=ON (L137 OR COPPER OR CU) AND L77
 L139 83983 SEA ABB=ON PLU=ON L11
 L140 1769 SEA ABB=ON PLU=ON (L139 OR VANADIUM OR V) AND L77
 L141 46743 SEA ABB=ON PLU=ON L13
 L142 2410 SEA ABB=ON PLU=ON (L141 OR LANTHANUM OR LA) AND L77
 L143 312426 SEA ABB=ON PLU=ON L14
 L144 3793 SEA ABB=ON PLU=ON (L143 OR NI OR NICKEL) AND L77
 L145 1784 SEA ABB=ON PLU=ON (L16 OR IRON OR FE) AND L77
 L146 182316 SEA ABB=ON PLU=ON L18
 L147 1264 SEA ABB=ON PLU=ON (L146 OR CHROMIUM OR CR) AND L77
 L148 8279 SEA ABB=ON PLU=ON (L133 OR L134 OR L135) OR L138 OR
 L140 OR L142 OR L144 OR L145 OR L147
 L149 109 SEA ABB=ON PLU=ON L148 AND HYDRID?
 L150 6 SEA ABB=ON PLU=ON L149 AND SUPPORT?
 D SCAN
 L151 7774 SEA ABB=ON PLU=ON (L129 OR L131 OR L139 OR L141 OR
 L143 OR L146 OR L137 OR L32 OR L6) AND L73
 L152 18969 SEA ABB=ON PLU=ON (SILVER OR AG OR COPPER OR CU OR
 VANADIUM OR V OR LANTHANUM OR LA OR NI OR NICKEL OR IRON
 OR FE OR CHROMIUM OR CR) AND L73
 L153 20530 SEA ABB=ON PLU=ON L151 OR L152
 L154 138 SEA ABB=ON PLU=ON L153 AND ((L78 OR L79 OR L80))
 L155 0 SEA ABB=ON PLU=ON L154 AND L85
 L156 7 SEA ABB=ON PLU=ON L154 AND L86
 L157 50 SEA ABB=ON PLU=ON L154 AND L87
 L158 5 SEA ABB=ON PLU=ON L156 AND L87
 L159 301 SEA ABB=ON PLU=ON L148 AND (L85 OR L86)
 L160 4 SEA ABB=ON PLU=ON L148 AND L85
 L161 297 SEA ABB=ON PLU=ON L148 AND L86
 L162 0 SEA ABB=ON PLU=ON L148 AND (L85 AND L86)
 L163 107 SEA ABB=ON PLU=ON L161 AND L87
 L164 0 SEA ABB=ON PLU=ON L163 AND L100
 L165 0 SEA ABB=ON PLU=ON L161 AND L100
 L166 0 SEA ABB=ON PLU=ON L161 AND L104
 L167 0 SEA ABB=ON PLU=ON L163 AND L104
 L168 0 SEA ABB=ON PLU=ON L159 AND (L100 OR L104)
 L169 49 SEA ABB=ON PLU=ON L148 AND (L100 OR L104)
 D QUE
 L170 0 SEA ABB=ON PLU=ON L169 AND HYDRID?
 L171 0 SEA ABB=ON PLU=ON L154 AND (L100 OR L104)

L172 72 SEA ABB=ON PLU=ON L153 AND (L100 OR L104)
 D QUE
 D QUE L151
 L173 8232 SEA ABB=ON PLU=ON (L129 OR L131 OR L139 OR L141 OR
 L143 OR L146 OR L137 OR L132 OR L6) AND L73
 L174 20536 SEA ABB=ON PLU=ON L173 OR L152
 D QUE
 L175 140 SEA ABB=ON PLU=ON L174 AND ((L78 OR L79 OR L80))
 L176 7 SEA ABB=ON PLU=ON L175 AND (L85 OR L86)
 L177 51 SEA ABB=ON PLU=ON L175 AND L87
 L178 51 SEA ABB=ON PLU=ON L177 AND SUPPORT?
 L179 0 SEA ABB=ON PLU=ON L178 AND (L100 OR L104)
 L180 3 SEA ABB=ON PLU=ON L178 AND L117
 D SCAN
 L181 1 SEA ABB=ON PLU=ON L178 AND HYDRID?
 D SCAN
 D KWIC
 L182 17 SEA ABB=ON PLU=ON L178 AND ALLOY?
 L183 34 SEA ABB=ON PLU=ON L21
 L184 277 SEA ABB=ON PLU=ON L183 OR PDAG OR AGPD
 L185 3692 SEA ABB=ON PLU=ON L22
 L186 2 SEA ABB=ON PLU=ON L24
 D SCAN
 L187 59 SEA ABB=ON PLU=ON L25
 L188 3841 SEA ABB=ON PLU=ON L186 OR L187 OR PDCU OR CUPD OR
 CU(A)PD
 L189 6226 SEA ABB=ON PLU=ON L184 OR PD(A)AG
 D 1-10 KWIC
 L190 1231 SEA ABB=ON PLU=ON L26
 L191 4463 SEA ABB=ON PLU=ON L188 OR L190
 L192 1755 SEA ABB=ON PLU=ON L27
 L193 2529 SEA ABB=ON PLU=ON L192 OR LANI5 OR NI5LA
 L194 831 SEA ABB=ON PLU=ON L19
 L195 11602 SEA ABB=ON PLU=ON L194 OR TIFE OR FETI OR FE(A)TI
 L196 6 SEA ABB=ON PLU=ON L28
 L197 567 SEA ABB=ON PLU=ON L31
 L198 15 SEA ABB=ON PLU=ON L196 OR CRV2 OR V2CR
 D SCAN
 L199 576 SEA ABB=ON PLU=ON L197 OR L198
 L200 157 SEA ABB=ON PLU=ON L32
 L201 715 SEA ABB=ON PLU=ON L200 OR (V(A)TI)(A)NI OR (V(A)NI)(A)T
 I OR (NI(A)TI)(A)V
 L202 779 SEA ABB=ON PLU=ON L33
 L203 5002 SEA ABB=ON PLU=ON V(A)NI
 D 1-10 KWIC
 L204 1079 SEA ABB=ON PLU=ON L34
 L205 290 SEA ABB=ON PLU=ON L186 OR L187 OR PDCU OR CUPD
 L206 97225 SEA ABB=ON PLU=ON L128 OR (L183 OR L184 OR L185 OR
 L186 OR L187) OR L190 OR (L192 OR L193 OR L194) OR TIFE
 OR FETI OR (L196 OR L197 OR L198 OR L199 OR L200) OR
 L202 OR (L204 OR L205)
 L207 11082 SEA ABB=ON PLU=ON (L183 OR L184 OR L185 OR L186 OR
 L187) OR L190 OR (L192 OR L193 OR L194) OR TIFE OR FETI
 OR (L196 OR L197 OR L198 OR L199 OR L200) OR L202 OR
 (L204 OR L205)
 L208 672 SEA ABB=ON PLU=ON L206 AND L77
 L209 79 SEA ABB=ON PLU=ON L207 AND L77
 D QUE L89
 L210 208 SEA ABB=ON PLU=ON L81 OR L82 OR L84 OR (L112 OR L113
 OR L114) OR L121
 L211 43 SEA ABB=ON PLU=ON L81 OR L97 OR (L112 OR L113 OR L114)
 OR L121
 L212 251 SEA ABB=ON PLU=ON L82 OR L84 OR L92 OR L93 OR L99 OR
 L108
 L213 251 SEA ABB=ON PLU=ON (L210 OR L211 OR L212)
 L214 24 SEA ABB=ON PLU=ON L213 AND L206

D SCAN TI
 L215 0 SEA ABB=ON PLU=ON L214 AND L1
 L216 56 SEA ABB=ON PLU=ON L175 AND L213
 L217 69 SEA ABB=ON PLU=ON L72
 L218 181 SEA ABB=ON PLU=ON L68
 L219 181 SEA ABB=ON PLU=ON L217 OR L218
 L220 43325 SEA ABB=ON PLU=ON PYROPHOSPHAT?
 D 1-10 KWIC
 L221 128841 SEA ABB=ON PLU=ON CONDUCTOR? OR CONDUCTANT?
 L222 2211 SEA ABB=ON PLU=ON L73 AND L221
 L223 26380 SEA ABB=ON PLU=ON L222 OR L77
 D QUE
 D QUE
 L224 15515 SEA ABB=ON PLU=ON MESOPOR?
 L225 85 SEA ABB=ON PLU=ON ZIRCONIUM(3A) PHOSPHAT? (3A) PYROPHOSPHA
 T? OR ZR(3A) PO4 (3A) P2O7 OR ZR(A) PO4 OR ZR(A) P2O7
 L226 4258 SEA ABB=ON PLU=ON ZIRCONIUM(A) PHOSPHAT? OR ZIRCONIUM(A)
 PYROPHOSPHAT?
 L227 12 SEA ABB=ON PLU=ON ZIRCONIUM(2A) PHOSPHAT? (2A) PYROPHOSPHA
 T?
 D SCAN
 L228 9 SEA ABB=ON PLU=ON ZR(A) P2O7
 L229 10 SEA ABB=ON PLU=ON ZR(2A) P2O7
 L230 19 SEA ABB=ON PLU=ON (L227 OR L228)
 L231 2 SEA ABB=ON PLU=ON L224 (2A) L230
 L232 2 SEA ABB=ON PLU=ON L224 (2A) L225
 D SCAN
 L233 13 SEA ABB=ON PLU=ON L224 (2A) L226
 D SCAN
 L234 13 SEA ABB=ON PLU=ON (L231 OR L232 OR L233)
 L235 0 SEA ABB=ON PLU=ON L213 AND L234
 L236 0 SEA ABB=ON PLU=ON L213 AND L234
 L237 1204 SEA ABB=ON PLU=ON MESO(A) POR?
 L238 791 SEA ABB=ON PLU=ON MESO(A) (PORE? OR POROUS? OR PORUS?)
 D 1-20 KWIC
 L239 16007 SEA ABB=ON PLU=ON L224 OR L238
 L240 4278 SEA ABB=ON PLU=ON L225 OR L226 OR L230
 L241 14 SEA ABB=ON PLU=ON L240 (3A) L239
 L242 0 SEA ABB=ON PLU=ON L213 AND L241
 L243 0 SEA ABB=ON PLU=ON L213 AND L239
 L244 1 SEA ABB=ON PLU=ON L213 AND L240
 D SCAN
 L245 89 SEA ABB=ON PLU=ON L77 AND L240
 L246 46 SEA ABB=ON PLU=ON L77 AND L239
 D 1-10 KWIC
 D QUE L241
 D QUE L226
 D QUE L22
 D QUE L225
 L247 17 SEA ABB=ON PLU=ON ZIRCONIUM(4A) PHOSPHAT? (4A) PYROPHOS?
 D 1-10 KWIC
 L248 4990 SEA ABB=ON PLU=ON ZIRCONIUM(4A) PHOSPHAT?
 D 1-10 KWIC
 L249 206 SEA ABB=ON PLU=ON ZIRCONIUM(4A) PYROPHOS?
 L250 12 SEA ABB=ON PLU=ON ZR(3A) P2O7
 L251 13 SEA ABB=ON PLU=ON ZR(4A) P2O7
 D 1-13 KWIC
 L252 13 SEA ABB=ON PLU=ON ZR(5A) P2O7
 L253 197 SEA ABB=ON PLU=ON ZR(3A) PO4
 D 1-13 KWIC
 L254 221 SEA ABB=ON PLU=ON ZR(4A) PO4
 D 1-13 KWIC
 L255 5189 SEA ABB=ON PLU=ON (L247 OR L248 OR L249 OR L250 OR
 L251 OR L252 OR L253 OR L254)
 L256 5262 SEA ABB=ON PLU=ON L219 OR L255
 L257 20 SEA ABB=ON PLU=ON L239 (4A) L256

L258	0	SEA ABB=ON	PLU=ON	L257 AND L213
L259	25	SEA ABB=ON	PLU=ON	L239 (6A) L256
L260	0	SEA ABB=ON	PLU=ON	L259 AND L213
L261	1	SEA ABB=ON	PLU=ON	L246 AND L256
		D SCAN		
L262	89	SEA ABB=ON	PLU=ON	L245 AND L256
L263	153	SEA ABB=ON	PLU=ON	L245 OR L246 OR L257 OR L261 OR L262
		D QUE L245		
		D QUE L246		
		D QUE L257		
		D QUE L261		
		D QUE L262		
L264	134	SEA ABB=ON	PLU=ON	L246 OR L261 OR L262
		D QUE L246		
		D QUE L262		
L265	1	SEA ABB=ON	PLU=ON	L246 AND L262
		D SCAN		
L266	37	SEA ABB=ON	PLU=ON	L239 (L) L256
L267	1	SEA ABB=ON	PLU=ON	L266 AND L73
		D SCAN		
L268	3	SEA ABB=ON	PLU=ON	L35
		D SCAN		
L269	83	SEA ABB=ON	PLU=ON	L38
L270	84	SEA ABB=ON	PLU=ON	L268 OR L269
L271	0	SEA ABB=ON	PLU=ON	L270 AND L213
L272	16	SEA ABB=ON	PLU=ON	L270 AND L77
L273	20	SEA ABB=ON	PLU=ON	L270 AND L73
L274	20	SEA ABB=ON	PLU=ON	L272 OR L273
		D SCAN TI		
L275	1398	SEA ABB=ON	PLU=ON	L39
L276	38	SEA ABB=ON	PLU=ON	L40
L277	4	SEA ABB=ON	PLU=ON	L41
L278	1099	SEA ABB=ON	PLU=ON	L42
		D SCAN L277		
L279	1400	SEA ABB=ON	PLU=ON	(L275 OR L276 OR L277 OR L278)
L280	0	SEA ABB=ON	PLU=ON	L213 AND L279
L281	23	SEA ABB=ON	PLU=ON	L279 AND L77
L282	8	SEA ABB=ON	PLU=ON	L279 AND L222
L283	23	SEA ABB=ON	PLU=ON	L279 AND L223
L284	23	SEA ABB=ON	PLU=ON	(L281 OR L282 OR L283)
L285	23	SEA ABB=ON	PLU=ON	L279 AND L73
L286	23	SEA ABB=ON	PLU=ON	L284 OR L285
L287	8574	SEA ABB=ON	PLU=ON	L43
L288	736	SEA ABB=ON	PLU=ON	L44
L289	642	SEA ABB=ON	PLU=ON	L45
		D QUE L287		
L290	18	SEA ABB=ON	PLU=ON	((L287 OR L288 OR L289)) AND L223
L291	44	SEA ABB=ON	PLU=ON	((L287 OR L288 OR L289)) AND L73
L292	173	SEA ABB=ON	PLU=ON	L46
L293	1	SEA ABB=ON	PLU=ON	L292 AND L223
L294	1	SEA ABB=ON	PLU=ON	L292 AND L73
L295	4	SEA ABB=ON	PLU=ON	SILVER (3A) IODIDE (3A) TETRATUNGSTATE
L296	0	SEA ABB=ON	PLU=ON	L295 AND L223
		D 295 1-4 KWIC		
		D 295 1-4 KWIC		
		D L295 1-4 KWIC		
L297	26	SEA ABB=ON	PLU=ON	L47
L298	19485	SEA ABB=ON	PLU=ON	L297 OR KH2PO4
		D 1-10 KWIC		
L299	13	SEA ABB=ON	PLU=ON	L298 AND L223
L300	16	SEA ABB=ON	PLU=ON	L298 AND L73
L301	421	SEA ABB=ON	PLU=ON	L48
L302	2	SEA ABB=ON	PLU=ON	L301 AND L223
L303	3	SEA ABB=ON	PLU=ON	L301 AND L73
L304	57	SEA ABB=ON	PLU=ON	L49

L305	3	SEA	ABB=ON	PLU=ON	L51
L306	1	SEA	ABB=ON	PLU=ON	(L304 OR L305) AND L223
L307	1	SEA	ABB=ON	PLU=ON	(L304 OR L305) AND L73
L308	46	SEA	ABB=ON	PLU=ON	CSDSO4
L309	0	SEA	ABB=ON	PLU=ON	L308 AND L223
L310	0	SEA	ABB=ON	PLU=ON	L308 AND L73
L311	547	SEA	ABB=ON	PLU=ON	L50
L312	5	SEA	ABB=ON	PLU=ON	L52
L313	574	SEA	ABB=ON	PLU=ON	L311 OR L312 OR CSH2PO4
L314	10	SEA	ABB=ON	PLU=ON	L313 AND L223
L315	10	SEA	ABB=ON	PLU=ON	L313 AND L73
L316	67	SEA	ABB=ON	PLU=ON	L53
L317	8	SEA	ABB=ON	PLU=ON	L316 AND L223
L318	8	SEA	ABB=ON	PLU=ON	L316 AND L73
L319	9	SEA	ABB=ON	PLU=ON	L58
L320	9	SEA	ABB=ON	PLU=ON	SILICA(3A) POLYPHOS? (3A) AMMONIUM
L321	1	SEA	ABB=ON	PLU=ON	L320 AND L223
L322	1	SEA	ABB=ON	PLU=ON	L320 AND L73
L323	82	SEA	ABB=ON	PLU=ON	SILICA(3A) ?PHOSPHAT? (3A) AMMONIUM
L324	1	SEA	ABB=ON	PLU=ON	L58 AND L223
L325	1	SEA	ABB=ON	PLU=ON	L58 AND L73
L326	1	SEA	ABB=ON	PLU=ON	L323 AND L223
L327	1	SEA	ABB=ON	PLU=ON	L323 AND L73
L328	5	SEA	ABB=ON	PLU=ON	L66
L329	1	SEA	ABB=ON	PLU=ON	L328 AND L73
L330	16	SEA	ABB=ON	PLU=ON	L67
L331	11	SEA	ABB=ON	PLU=ON	L330 AND L73
L332	11	SEA	ABB=ON	PLU=ON	L330 AND L223
L333	1343	SEA	ABB=ON	PLU=ON	L223 AND (MU?(W)M OR MICRON? OR MICROMETER? OR MICROMETR? OR MICRO(A) (METER? OR METR?))
L334	1343	SEA	ABB=ON	PLU=ON	L333 AND L223
L335	17	SEA	ABB=ON	PLU=ON	L333 AND L213
L336	7092	SEA	ABB=ON	PLU=ON	L223 AND (FACE? OR SIDE? OR SURFACE?)
L337	441	SEA	ABB=ON	PLU=ON	L336 AND L86
L338	2	SEA	ABB=ON	PLU=ON	L337 AND GAP D SCAN
L339	107	SEA	ABB=ON	PLU=ON	L337 AND TEMP?
L340	15	SEA	ABB=ON	PLU=ON	L339 AND SUPPORT?
L341	0	SEA	ABB=ON	PLU=ON	L337 AND L85
L342	7	SEA	ABB=ON	PLU=ON	L336 AND L85
L343	22	SEA	ABB=ON	PLU=ON	L340 OR L342
L344	6	SEA	ABB=ON	PLU=ON	L343 AND (METAL? OR HYDRID?) D SCAN
L345	157	SEA	ABB=ON	PLU=ON	L223 AND GAP
L346	30	SEA	ABB=ON	PLU=ON	L345 AND TEMP?
L347	69	SEA	ABB=ON	PLU=ON	L335 OR L338 OR L340 OR (L342 OR L343 OR L344) OR L346
L348	55	SEA	ABB=ON	PLU=ON	L347 AND TEMP?
L349	126	SEA	ABB=ON	PLU=ON	L223 AND (PERCENT? OR PCT? OR PER(A) CENT?)
L350	26	SEA	ABB=ON	PLU=ON	L349 AND (WEIGHT? OR WT?)
L351	4	SEA	ABB=ON	PLU=ON	L348 AND (WEIGHT? OR WT?)
L352	51	SEA	ABB=ON	PLU=ON	L150 OR L158 OR (L180 OR L181 OR L182) OR L214 OR L244 OR L265 OR L267
L353	20	SEA	ABB=ON	PLU=ON	(L272 OR L273 OR L274)
L354	58	SEA	ABB=ON	PLU=ON	L286 OR L290 OR L293 OR L294 OR L299 OR L300 OR L302 OR L303 OR L306
L355	30	SEA	ABB=ON	PLU=ON	L307 OR L314 OR L317 OR L321 OR L324 OR L326 OR L329 OR L332
L356	30	SEA	ABB=ON	PLU=ON	L350 OR L351
L357	182	SEA	ABB=ON	PLU=ON	(L352 OR L353 OR L354 OR L355 OR L356)
L358	241	SEA	ABB=ON	PLU=ON	L357 OR L347
L359	230	SEA	ABB=ON	PLU=ON	L358 AND L223 D QUE

L360 76 SEA ABB=ON PLU=ON L359 AND SUPPORT?
 L361 197 SEA ABB=ON PLU=ON L359 AND (METAL? OR HYDRID? OR L85
 OR L86 OR L100 OR L104 OR FACE? OR SIDE? OR SURFACE? OR
 TEMP?)
 L362 73 SEA ABB=ON PLU=ON L361 AND SUPPORT?
 L363 101 SEA ABB=ON PLU=ON L148 AND L361
 L364 13 SEA ABB=ON PLU=ON L361 AND L149
 L365 80 SEA ABB=ON PLU=ON L362 OR L364
 D QUE L175
 L366 30 SEA ABB=ON PLU=ON L361 AND L175
 L367 80 SEA ABB=ON PLU=ON L365 OR L366
 D QUE L206
 L368 35 SEA ABB=ON PLU=ON L361 AND L208
 L369 89 SEA ABB=ON PLU=ON L367 OR L368
 L370 56 SEA ABB=ON PLU=ON L361 AND L213
 L371 96 SEA ABB=ON PLU=ON L369 OR L370
 L372 3 SEA ABB=ON PLU=ON L361 AND L245
 L373 98 SEA ABB=ON PLU=ON L371 OR L372
 D QUE L263
 D QUE L264
 L374 6 SEA ABB=ON PLU=ON L361 AND L264
 L375 99 SEA ABB=ON PLU=ON L373 OR L374
 L376 10 SEA ABB=ON PLU=ON L361 AND L314
 L377 105 SEA ABB=ON PLU=ON L375 OR L376
 L378 16 SEA ABB=ON PLU=ON L361 AND (L317 OR L321 OR L324 OR
 L326 OR L329 OR L331)
 L379 116 SEA ABB=ON PLU=ON L377 OR L378

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L379 ANSWER 1 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2005:741752 Development of Nafion-/SiO₂/phosphotungstic acid nanocomposite membranes for high **temperature** proton exchange membrane fuel cells. Liu, Yuxiu; Kunz, H. Russell; Fenton, James M.; Zhu, Lei (Polymer Program, Institute of Materials Science and Department of Chemical Engineering, University of Connecticut, Storrs, CT, 06269, USA). Abstracts of Papers, 230th ACS National Meeting, Washington, DC, United States, Aug. 28-Sept. 1, 2005, PMSE-414. American Chemical Society: Washington, D. C. (English) 2005. CODEN: 69HFCL.

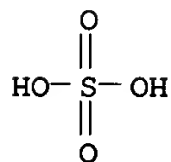
AB Research has been conducted to improve the conductivity of Nafion--based nanocomposite membranes for proton exchange membrane (PEM) **fuel cells** at high **temperature** and low relative humidity. 3-Aminopropyl triethoxysilane (APTES) modified **mesoporous** silica (SBA-15) was used to immobilize phosphotungstic acid (PTA) through **ionic** complexation processes. These composites were denoted as SAP. Thermogravimetric anal. (TGA) was used to determine the APTES functionalization ratio and PTA immobilization **percentage**. TGA results indicated that PTA was successfully immobilized, and the highest loading on porous silica was ca. 67 **weight%**. Nafion- membranes with different SAP contents (denoted as NSAP) were cast from 5 **weight%** ethanol solution at 70 °C. Small-angle X-ray scattering results on the SAP composites revealed hexagonal cylinder morphol., which was further confirmed by transmission electron microscopy. DC conductivity measurements at various **temps.** and relative humidities showed slightly higher conductivity for the NSAP membranes than the recast Nafion- membrane.

L379 ANSWER 2 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2005:638259 Polymer nanocomposite membranes, their manufacture, and their use for membrane-electrode assemblies and polymer **electrolyte fuel cells**. Lee, Hee-Wu; Song, Ming-Gyu; Kim, Young-Taek; Park, Seung-Bae; Park, Jin-Ki (Hyundai Motor Corp., S. Korea; Kia Motors Corp.). Jpn. Kokai Tokkyo Koho JP 2005197209 A2 20050721, 16 pp. (Japanese). CODEN:

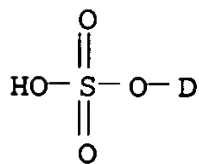
JKXXAF. APPLICATION: JP 2004-258793 20040906. PRIORITY: KR
2003-100130 20031230.

- AB The polymer nanocomposite membranes comprise 30-95 **weight%** matrixes comprising **ion-exchange** resins having **cation-exchange** groups in **side** chains and 5-70 **weight%** finely and uniformly dispersed powders of solid **H+ conductors**. The polymer nanocomposite membranes are manufactured by (a) dissolving **ion-exchange** resins having **cation-exchange** groups in **side** chains into organic solvents to produce **ion-exchange** resin solns. (concentration 0.5-30 **weight%**), (b) mixing the solns. with porogens under high-frequency ultrasonic waves and forming polymer membranes, (c) extracting the porogens from the polymer membranes to form nanopores, and (d) filling the nanopores with solid **H+ conductors** so that 5-70 **weight%** of the solid **H+ conductors** are dispersed in 30-95 **wt %** of the **ion-exchange** resins. The nanocomposite membranes have high elec. conductivity at high **temperature**, good mech. properties, dimensional stability, and high fuel-separation performance are useful for membrane-electrode assemblies for polymer **electrolyte fuel cells**.
- IT 7789-16-4, Cesium hydrogen sulfate 93487-19-5, Cesium deuterium sulfate
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(**proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- RN 7789-16-4 HCAPLUS
- CN Sulfuric acid, monocation salt (8CI, 9CI) (CA INDEX NAME)



● Cs

- RN 93487-19-5 HCAPLUS
- CN Sulfuric acid-d, monocation salt (9CI) (CA INDEX NAME)



● Cs

- IC ICM H01M008-02
ICS H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
- ST **cation** exchanger **proton conductor**
nanocomposite membrane; polymer **electrolyte fuel**

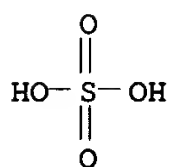
- cell nanocomposite membrane**
- IT Polyimides
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (coating on nanocomposite membrane; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT Glycols
 RL: NUU (Other use, unclassified); USES (Uses)
 (ethers, solvent; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT Polyoxyalkylenes
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (fluorine- and sulfo-containing, **ionomers**, Nafion; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT Ethers
 RL: NUU (Other use, unclassified); USES (Uses)
 (glycol, solvent; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT **Cation exchangers**
Fuel cell electrolytes
Ionic conductors
 Membranes, nonbiological
 Nanocomposites
 Porogens
 (manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT Fluoropolymers
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT Solvents
 (organic; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT **Fuel cells**
 (polymer **electrolyte**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT Fluoropolymers
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (polyoxyalkylene-, sulfo-containing, **ionomers**, Nafion; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT **Ionomers**

- RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (polyoxyalkylenes, fluorine- and sulfo-containing, Nafion; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT Polyesters
 RL: NUU (Other use, unclassified); USES (Uses)
 (porogen; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT Clays
 Mica-group minerals
 Zeolites (synthetic)
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (support for **proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT Phosphosilicate glasses
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (zirconium phosphosilicate, **proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT 9002-86-2, Poly(vinyl chloride) 24937-79-9, Poly(vinylidene fluoride) 24981-14-4, Poly(vinyl fluoride)
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (coating on nanocomposite membrane; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT 7631-86-9, Silica
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (glass component, support for **proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT 1314-23-4, Zirconia 1314-56-3, Phosphorus pentoxide
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (glass component; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT 96-49-1, Ethylene carbonate 105-58-8, Diethyl carbonate 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate
 RL: NUU (Other use, unclassified); USES (Uses)
 (porogen, solvent; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT 84-74-2, Dibutyl phthalate 103-23-1, Dioctyl adipate 117-81-7, Dioctyl phthalate 1330-78-5, Tritolyl phosphate 9003-53-6,

- Polystyrene 19295-81-9, Heptyl nonyl phthalate 24980-41-4,
 Polycaprolactone 25248-42-4, Polycaprolactone 27554-26-3
 RL: NUU (Other use, unclassified); USES (Uses)
 (porogen; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT 13772-29-7P
 RL: DEV (Device component use); IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PYP (Physical process); PREP (Preparation); PROC (Process); USES (Uses)
 (**proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT 1314-60-9, Antimony pentoxide 7789-16-4, Cesium hydrogen sulfate 12209-84-6, Antimony nitrate oxide (Sb₄(NO₃)₂O₅) 18282-10-5, Tin dioxide 93487-19-5, Cesium deuterium sulfate 107069-88-5, Antimony hydroxide oxide phosphate (Sb₃(OH)₃O₃(PO₄)₂) 107250-82-8, hydrogen titanium oxide (H₂Ti₄O₉) 142487-25-0 165901-90-6 210536-75-7 307943-55-1, Uranium arsenate oxide (U(HAsO₄)O₂) 307943-57-3, Uranium oxide phosphate (UO₂(HPO₄)) 860020-46-8 860020-47-9 860020-48-0
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (**proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT 60-29-7, Diethyl ether 64-17-5, Ethanol 67-56-1, Methanol 67-63-0, 2-Propanol 67-64-1, Acetone 67-68-5, Dimethyl sulfoxide 68-12-2, Dimethylformamide 78-59-1, Isophorone 78-93-3, Methyl ethyl ketone 96-48-0, Butyrolactone 108-10-1, Methyl isobutyl ketone 108-83-8, Diisobutyl ketone 108-94-1, Cyclohexanone 109-99-9, Tetrahydrofuran 112-15-2, Carbitol acetate 115-10-6, Dimethyl ether 123-42-2, Diacetone alcohol 123-86-4, N-Butyl acetate 127-19-5, Dimethylacetamide 141-97-9, Ethyl acetoacetate 512-56-1, Trimethyl phosphate 632-22-4, Tetramethylurea 872-50-4, N-Methyl-2-pyrrolidone
 RL: NUU (Other use, unclassified); USES (Uses)
 (solvent; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- IT 1344-28-1, Alumina
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (**support for proton conductor**; manufacture of porous polymer-solid **proton conductor** nanocomposite membranes for membrane-electrode assemblies and polymer **electrolyte fuel cells**)
- L379 ANSWER 3 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2005:591653 Document No. 143:81245 Method for manufacture of **proton-conductive solid electrolyte** films for **fuel cells** showing high operating **temperature**. Otomo, Junichiro; Takahashi, Hiroshi; Ogura, Masaru; Wang, Ju-Jiang; Kobayashi, Takeshi; Waki, Keiko; Nagamoto, Hidetoshi (Tokyo University, Japan). Jpn. Kokai Tokkyo Koho JP 2005183121 A2 20050707, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-420994 20031218.
- AB The method includes preparing silica thin films having open nanopores on main **surfaces**, preparing aqueous solns. or melts containing CsHSO₄ (I) and/or CsH₂PO₄ (II), and impregnating the nanopores

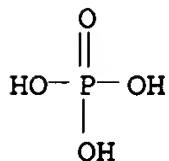
with the solns. or melts to form solid **electrolyte** films comprising I and/or II. **Fuel cells** using the solid **electrolyte** films show operating temperature $\geq 150^\circ$.

IT 7789-16-4, Cesium hydrogen sulfate 18649-05-3, Cesium dihydrogen phosphate
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (electrolytes; manufacture of **proton-conductive solid electrolyte** films for **fuel cells** showing high operating temp
 .)
 RN 7789-16-4 HCAPLUS
 CN Sulfuric acid, monocation salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 18649-05-3 HCAPLUS
 CN Phosphoric acid, monocation salt (8CI, 9CI) (CA INDEX NAME)



● Cs

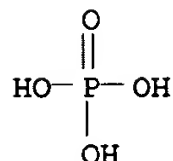
IC ICM H01B013-00
 ICS H01B001-06; H01M008-02; H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38
 ST cesium hydrogen sulfate nanoporous silica solid **electrolyte** film; nanoporous silica film solid **electrolyte** cesium dihydrogen phosphate; **fuel cell** solid **electrolyte proton conductor**
 IT **Fuel cell electrolytes**
 Solid **electrolytes**
 (manufacture of **proton-conductive solid electrolyte** films for **fuel cells** showing high operating temperature)
 IT **Ionic conductors**
 (protonic; manufacture of **proton-conductive solid electrolyte** films for **fuel cells** showing high operating temp
 .)
 IT **Fuel cells**
 (solid **electrolyte**; manufacture of **proton-conductive solid electrolyte** films for **fuel cells** showing high operating temp
 .)

- IT 7789-16-4, Cesium hydrogen sulfate 18649-05-3,
Cesium dihydrogen phosphate
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); TEM (Technical or
engineered material use); PROC (Process); USES (Uses)
(electrolytes; manufacture of proton-
conductive solid electrolyte films for
fuel cells showing high operating temp
.)
- IT 7631-86-9, Silica, uses
RL: DEV (Device component use); TEM (Technical or engineered
material use); USES (Uses)
(nanoporous film supports; manufacture of proton-
conductive solid electrolyte films for
fuel cells showing high operating temp
.)
- L379 ANSWER 4 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:552858 Effect of water vapor on **proton conduction**
of cesium dihydrogen phosphate and application to intermediate
temperature fuel cells. Otomo, Junichiro; Tamaki, Takanori;
Nishida, Satoru; Wang, Shuqiang; Ogura, Masaru; Kobayashi, Takeshi;
Wen, Ching-ju; Nagamoto, Hidetoshi; Takahashi, Hiroshi (Department
of Environmental Chemical Engineering, Faculty of Engineering,
Kogakuin University, Hachioji-city, Tokyo, 192-0015, Japan).
Journal of Applied Electrochemistry, 35(9), 865-870 (English) 2005.
CODEN: JAELBJ. ISSN: 0021-891X. Publisher: Springer.
- AB The **proton conduction** and superionic phase
transition of cesium dihydrogen phosphate, **CsH₂PO₄** (CDP),
were investigated under various humid conditions to evaluate the
applicability of a **CsH₂PO₄** solid electrolyte to
an intermediate **temperature fuel cell**
operating between 230 °C and 300 °C. The phase
stability, superionic phase transition, and reversibility of
dehydration of **CsH₂PO₄** were evaluated under different
ambient water vapor concns., from 0 to 90 mol%, through the
measurements of conductivity. The dependence of conductivity on the water vapor
concentration and the demonstrated reversibility of dehydration clearly
showed the range in which **CsH₂PO₄** is applicable to the
intermediate **temperature fuel cell**. Addnl.,
we evaluated the protonic transport number of **CsH₂PO₄**, which
was almost unity, and demonstrated **fuel cell**
operation at 250 °C using a single cell fabricated with the
CsH₂PO₄ electrolyte.
- CC 72 (Electrochemistry)
- L379 ANSWER 5 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:452567 Document No. 143:46007 An intermediate **temperature**
proton-conducting electrolyte based on a
CsH₂PO₄/SiP₂O₇ composite. Matsui, Toshiaki; Kukino,
Tomokazu; Kikuchi, Ryuji; Eguchi, Koichi (Department of Energy and
Hydrocarbon Chemistry, Graduate School of Engineering, Kyoto
University, Kyoto, 615-8510, Japan). Electrochemical and
Solid-State Letters, 8(5), A256-A258 (English) 2005. CODEN: ESLEF6.
ISSN: 1099-0062. Publisher: Electrochemical Society.
- AB A p-conducting electrolyte based on a **CsH₂PO₄/SiP₂O₇**
composite was synthesized and its electrochem. properties were
studied at 110-287°. Addition of SiP₂O₇ as **supporting**
matrix brought about a structural change of the conducting phase,
CsH₂PO₄, into CsH₅(PO₄)₂. The resultant composite
electrolyte showed high thermal stability and conductivity under 30% H₂O/Ar
atmospheric. The maximum conductivity was 44 mS/cm at 266° and the
temperature dependence of the conductivity did not have the conductivity
irregularities of the **CsH₂PO₄**-based composite.
- IT 18649-05-3P, Cesium phosphate (**CsH₂PO₄**)
RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or

engineered material use); PREP (Preparation); USES (Uses)
 (composite with silicon pyrophosphate; $\text{CsH}_2\text{PO}_4/\text{SiP}_2\text{O}_7$
 composite **proton-conducting**
electrolyte for intermediate **temperature fuel**
cells)

RN 18649-05-3 HCAPLUS

CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST cesium phosphate silicon pyrophosphate composite **electrolyte**
fuel cell

IT **Fuel cell electrolytes**
 ($\text{CsH}_2\text{PO}_4/\text{SiP}_2\text{O}_7$ composite **proton-**
conducting electrolyte for intermediate
temperature fuel cells)

IT **Ionic conductors**
 (**protonic**; $\text{CsH}_2\text{PO}_4/\text{SiP}_2\text{O}_7$ composite
proton-conducting electrolyte for
 intermediate **temperature fuel cells**)

IT 13827-38-8P, Silicon pyrophosphate (SiP_2O_7)
 RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); PREP (Preparation); USES (Uses)
 (composite with cesium phosphate; $\text{CsH}_2\text{PO}_4/\text{SiP}_2\text{O}_7$
 composite **proton-conducting**
electrolyte for intermediate **temperature fuel**
cells)

IT 18649-05-3P, Cesium phosphate (CsH_2PO_4)
 RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); PREP (Preparation); USES (Uses)
 (composite with silicon pyrophosphate; $\text{CsH}_2\text{PO}_4/\text{SiP}_2\text{O}_7$
 composite **proton-conducting**
electrolyte for intermediate **temperature fuel**
cells)

L379 ANSWER 6 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2005:452563 Document No. 143:46005 Thin-membrane solid-acid fuel cell.
 Uda, Tetsuya; Haile, Sossina M. (Department of Materials Science,
 California Institute of Technology, Pasadena, CA, 91125, USA).
 Electrochemical and Solid-State Letters, 8(5), A245-A246 (English)
 2005. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical
 Society.

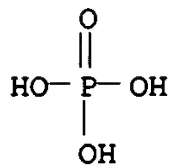
AB Solid-acid **fuel cells** (SAFCs) use an anhydrous,
 non-polymeric p conducting **electrolyte** and operate at
 slightly elevated **temps**. By **supporting** thin
 CsH_2PO_4 electrolyte membranes (25-36 μm), on
 porous stainless steel gas-diffusion electrodes, SAFCs with peak
 power densities $\leq 415 \text{ mW/cm}^2$ were obtained. Cells were
 operated at .apprx.240° with humidified H_2 supplied to the
 anode and humidified O_2 supplied to the cathode. Despite the
 thinness of the membranes, the open-circuit voltages were high,
 0.91-1.01 V. SAFCs are competitive energy conversion devices.

IT 18649-05-3, Cesium phosphate (CsH_2PO_4)
 RL: DEV (Device component use); USES (Uses)
 (**electrolyte**; in thin membrane solid-acid **fuel**

cells)

RN 18649-05-3 HCAPLUS

CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT 12597-68-1, Stainless steel, uses

RL: DEV (Device component use); USES (Uses)

(electrode support; in thin membrane solid-acid fuel cells)

IT 18649-05-3, Cesium phosphate (CsH_2PO_4)

RL: DEV (Device component use); USES (Uses)

(electrolyte; in thin membrane solid-acid fuel cells)

L379 ANSWER 7 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2005:315268 Document No. 142:466376 CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer

electrolyte fuel cells. Yoshida,

Kotaro; Ishida, Masayoshi; Okada, Tatsuhiro (Graduate School of Systems and Information Engineering, University of Tsukuba, Tennoudai 1-1-1, Tsukuba, 305-8573, Japan). Electrochemistry (Tokyo, Japan), 73(4), 298-300 (Japanese) 2005. CODEN: EECTFA. ISSN: 1344-3542. Publisher: Electrochemical Society of Japan.

AB Fluorination is known to prohibit CO adsorption at **LaNi5****group metal hydride.** This characteristic wasapplied to fabricate a CO tolerant fluorinated Pt black catalyst by exposing it in diluted F2 gas. To test the CO tolerance, H2 oxidation current in H2 gas with fixed amount of CO was measured by using a half cell simulating the anode of a polymer **electrolyte****fuel cell.** The results show that fluorinated Pt

black, especially those treated in low F2 concentration (1%), improved CO tolerance. On the other hand, treating in high F2 concentration (10%)

decreased the active surface area of Pt catalyst for H2

oxidation. These electrochem. characteristics together with the results

in XPS spectra indicated that chemisorption of F, not the formation

of Pt fluoride, improved the CO.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT **Fuel cell anodes**(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer **electrolyte fuel cells**)

IT 7440-06-4, Platinum, uses

RL: CAT (Catalyst use); CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)

(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer **electrolyte fuel cells**)

IT 7782-41-4, Fluorine, uses

RL: MOA (Modifier or additive use); USES (Uses)

(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer **electrolyte fuel cells**)

IT 630-08-0, Carbon monoxide, miscellaneous

RL: MSC (Miscellaneous)

(CO poisoning tolerance of fluorinated Pt catalysts for the anode in polymer **electrolyte fuel cells**)

L379 ANSWER 8 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2005:190841 Ba₃-xKxHx(PO₄)₂:synthesis and properties of a new class of solid state **proton conductors**. Chisholm, Calum

R. I.; Haile, Sossina M. (Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Abstracts of Papers, 229th ACS National Meeting, San Diego, CA, United States, March 13-17, 2005, INOR-451. American Chemical Society: Washington, D. C. (English) 2005. CODEN: 69GQMP.

AB Compds. with the general formula M₁₃H(XO₄), - M= Cs, Rb, NH₄ and X = S, Se are known to undergo superprotonic transitions to trigonal structures with very high **protonic conductivity** (.apprx. 10⁻² Ω⁻¹cm⁻¹), making them very appealing as solid state **electrolytes** in **fuel cell**. Unfortunately, these compds. are reduced when used as **fuel cell electrolytes**. Interestingly, phosphate analogs exist, with general formula M₂₃(PO₄)₂, which exhibit nearly identical trigonal structures. Moreover, the superprotonic phosphate **CsH₂PO₄** has recently been shown to be stable under **fuel cell** operational conditions. Compds. with stoichiometry Ba₂₃-xK+1xHx (PO₄)₂, 0 < x < 1, were therefore synthesized to combine the trigonal structure and chemical stability of Ba₃(PO₄)₂ with the superprotonic conductivity of the M₁₃H(XO₄) compds. Indeed, the **protonic conductivity** of the Ba₂₃-xK+1xHx (PO₄)₂ compds. increased by 1000 times compared to that of Ba₃(PO₄)₂. However, the level of conductivity was still 100 times less than that expected for a superprotonic phase due to local order within the structure, to be detailed in the talk. Figure 6. Conductivity of pure Ba₃(PO₄)₂ and three synthesized Ba₃-xKxHx(PO₄)₂ compds.

L379 ANSWER 9 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2005:146193 Document No. 142:376429 Characterisation of intermediate **temperature** polyphosphate composites. Uma, T.; Tu, H. Y.; Freude, D.; Schneider, D.; Stimming, U. (Technische Universitaet Muenchen, Garching, D-85748, Germany). Journal of Materials Science, 40(1), 227-230 (English) 2005. CODEN: JMTSAS. ISSN: 0022-2461. Publisher: Springer.

AB Solid state **proton conductors** which show high conductivities in the medium **temperature** range (100 °C-200 °C) with low humidity are required as the **electrolyte** for polymer **electrolyte fuel cells** and direct methanol **fuel cells** operating in the **temperature** range. In the present work, amorphous ammonium silicon polyphosphate **electrolytes** were prepared from NH₄H₂PO₄ (ammonium dihydrogen phosphate), (NH₂)₂CO (urea), and tetraethoxysilane by the sol-gel method and evaluated for use as **proton conductive** materials at intermediate **temps**. The formation of (NH₄)₂SiP₄O₁₃ was confirmed by powder X-ray diffraction. The particle size of (NH₄)₂SiP₄O₁₃ was in the range 4-7 μm. ³¹P MAS NMR measurements showed that the phosphorus chain length of about 300 phosphate-units in (NH₄)₂SiP₄O₁₃ decreases upon processing to a value of 5 for (NH₄)₂SiP₄O₁₃ and increased again after activation up to 50. After an initial mass loss (mostly NH₃) of 3.5 % the material is thermally stable upon cycling between 50 °C and 300 °C. The conditioned conductivity values varied from 7.75 x 10⁻⁶ at 50 °C to 1.45 x 10⁻² S cm⁻¹ at 300 °C in dry nitrogen gas atmospheric

IT **61288-44-6P**, Ammonium silicon (tetraphosphate) ((NH₄)₂Si(P₄O₁₃))

RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)

(characterization of intermediate **temperature** polyphosphate composites for use as **fuel cell electrolytes**)

RN **61288-44-6** HCAPLUS

CN Ammonium silicon (tetraphosphate) ((NH₄)₂Si(P₄O₁₃)) (9CI) (CA INDEX

NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O13P4	1	16132-64-2
H4N	2	14798-03-9
Si	1	7440-21-3
CC	52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 49	
ST	fuel cell electrolyte ammonium silicon polyphosphate composite cond	
IT	Fuel cell electrolytes Heat treatment (characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)	
IT	Polyphosphates RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation) (characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)	
IT	Phosphates, preparation RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation) (silico-, ammonium salts ; characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)	
IT	61288-44-6P, Ammonium silicon (tetraphosphate) ((NH ₄) ₂ Si(P ₄ O ₁₃)) RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation) (characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)	
IT	57-13-6, Urea, reactions 78-10-4, Tetraethoxysilane 7722-76-1, Ammonium phosphate (NH ₄ H ₂ PO ₄) RL: RCT (Reactant); RACT (Reactant or reagent) (characterization of intermediate temperature polyphosphate composites for use as fuel cell electrolytes)	

L379 ANSWER 10 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2005:108164 Document No. 142:357914 Proton

conductivity of mesoporous sol-gel**zirconium phosphates for fuel**

cell applications. Hogarth, Warren H. J.; Diniz da Costa, Joao C.; Drennan, John; Lu, G. Q. (Australian Research Council (ARC), Centre for Functional Nanomaterials, University of Queensland, Brisbane, 4072, Australia). Journal of Materials Chemistry, 15(7), 754-758 (English) 2005. CODEN: JMACEP. ISSN: 0959-9428. Publisher: Royal Society of Chemistry.

AB **Zirconium phosphate** was extensively studied as a **proton conductor** for proton exchange membrane (PEM) **fuel cell** applications. Here the authors report the synthesis of **mesoporous, templated** sol-gel **zirconium phosphate** for use in PEM applications in an effort to determine its suitability for use as a **surface functionalized, solid acid proton conductor** in the future. **Mesoporous zirconium phosphates** were synthesized using an acid-base pair mechanism with **surface** areas between 78 and 177 m² g⁻¹ and controlled pore sizes at 2-4 nm. TEM characterization confirmed the presence of a wormhole like pore

structure. The conductivity of such materials was up to 4.1×10^{-6} S cm⁻¹ at 22 °C and 84% relative humidity (RH), while humidity reduction resulted in a conductivity decrease by more than an order of magnitude. High temperature testing on the samples confirmed their dependence on hydration for **proton conduction** and low hygroscopic nature. While the conductivity of these materials is low compared to Nafion, they may be a good candidate as a **surface functionalized solid acid proton conductor** due to their high **surface area**, porous structure and inherent ability to **conduct protons**.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 67, 76

ST **proton cond mesoporous sol
zirconium phosphate fuel cell
membrane**

IT Pore size
(controlled to 2-4 nm; **proton conductivity of
mesoporous sol-gel zirconium phosphates
for fuel cell applications**)

IT Pore
(**mesopore; proton conductivity of
mesoporous sol-gel zirconium phosphates
for fuel cell applications**)

IT Pore size distribution
Pore structure
Sol-gel processing
(**proton conductivity of mesoporous sol-gel
zirconium phosphates for fuel
cell applications**)

IT **Fuel cells**
(proton exchange membrane, membrane materials for; **proton
conductivity of mesoporous sol-gel zirconium
phosphates for fuel cell
applications**)

IT **Ionic conductivity**
(**proton; proton conductivity of
mesoporous sol-gel zirconium phosphates
for fuel cell applications**)

IT 691397-13-4, Pluronic P 123
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP
(Physical, engineering or chemical process); REM (Removal or
disposal); PROC (Process); USES (Uses)
(porogen, Pluronic P 123, F 108 and F 127; **proton
conductivity of mesoporous sol-gel zirconium
phosphates for fuel cell
applications**)

IT 1119-97-7, Tetradecyltrimethylammonium bromide
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP
(Physical, engineering or chemical process); REM (Removal or
disposal); PROC (Process); USES (Uses)
(porogen; **proton conductivity of mesoporous
sol-gel zirconium phosphates for fuel
cell applications**)

IT 64-17-5, Ethanol, uses
RL: NUU (Other use, unclassified); USES (Uses)
(**proton conductivity of mesoporous sol-gel
zirconium phosphates for fuel
cell applications**)

IT 13765-95-2P, Zirconium phosphate
RL: PRP (Properties); SPN (Synthetic preparation); PREP
(Preparation)
(**proton conductivity of mesoporous sol-gel
zirconium phosphates for fuel
cell applications**)

IT 7719-12-2, Phosphorus trichloride 52892-19-0

RL: RCT (Reactant); RACT (Reactant or reagent)
 (proton conductivity of mesoporous sol-gel
 zirconium phosphates for fuel
 cell applications)

- L379 ANSWER 11 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2005:75833 Document No. 142:138385 Hybrid organic-inorganic
proton conductors, their manufacture, and
 membrane-electrode assemblies and **fuel cells**
 using them. Matsuo, Juho; Omichi, Takahiro (Teijin Ltd., Japan).
 Jpn. Kokai Tokkyo Koho JP 2005025945 A2 20050127, 25 pp.
 (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-186541 20030630.
- AB The **proton conductors** comprise organic polymer
proton conductors, and inorg. **proton**
conductors comprising condensates of phosphoric acids, Lewis
 acidic metal alkoxides, and Si oxide precursors, e.g.,
 alkoxysilanes, where the organic and inorg. **proton**
conductors form interpenetrating networks. In the manufacture,
 phosphoric acids were hydrolyzed and condensed with the alkoxides
 and the precursors in solvents, added to organic polymer **proton**
conductor solns., and cast into **films**. The
 assemblies have the **proton conductors** sandwiched
 between catalyst electrodes containing **metals**
supported on fine elec. conductive particles. The
proton conductors show good flexibility, and
 oxidation and swelling resistance, resulting in **fuel**
cells showing good dimensional stability.
- IC ICM H01M008-02
 ICS C08G079-14; C08J005-22; C08L081-06; C08L085-00; H01B001-06;
 H01B013-00; H01M004-86; H01M008-10; C08G075-23
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38, 76
- ST hybrid org inorg **proton conductor**
 interpenetrating network **fuel cell**; phosphoric
 acid condensate **electrolyte fuel cell**;
 Lewis acid metal alkoxide condensate **electrolyte**
fuel cell; alkoxysilane condensate
electrolyte fuel cell
- IT **Metal alkoxides**
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP
 (Preparation); USES (Uses)
 (Lewis acidic, condensates with solid acids and silicon oxide
 precursors; manufacture of hybrid organic-inorg. **proton**
conductors forming interpenetrating networks for
 membrane-electrode assemblies for **fuel cells**)
- IT **Fuel cell electrodes**
Fuel cell electrolytes
Fuel cells
 Hybrid organic-inorganic materials
 (manufacture of hybrid organic-inorg. **proton conductors**
 forming interpenetrating networks for membrane-electrode
 assemblies for **fuel cells**)
- IT Polysulfones, uses
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP
 (Preparation); USES (Uses)
 (polyether-, sulfonated, chlorided, reaction products with
 ethylamine; manufacture of hybrid organic-inorg. **proton**
conductors forming interpenetrating networks for
 membrane-electrode assemblies for **fuel cells**)
- IT Polyketones
 Polysulfones, uses
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP
 (Preparation); USES (Uses)
 (polyether-, sulfonated; manufacture of hybrid organic-inorg.
proton conductors forming interpenetrating
 networks for membrane-electrode assemblies for **fuel**

- cells)
- IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polyketone-, sulfonated; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polysulfone-, sulfonated, chlorided, reaction products with ethylamine; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polysulfone-, sulfonated; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT **Ionic conductors**
(**protonic**; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT 7440-44-0, Carbon, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(elec. conductive particles, catalyst **supported on**; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT 75-04-7DP, Ethylamine, reaction product with polyether-polyketone sulfonyl chlorides 78-10-4DP, Tetraethoxysilane, reaction product with phosphoric acid and **titanium** tetraisopropoxide 546-68-9DP, **Titanium** tetraisopropoxide, reaction products with phosphoric acid and alkoxysilanes 780-69-8DP, Phenyltriethoxysilane, reaction product with phosphoric acid, **titanium** tetraisopropoxide, and tetraethoxysilane 7429-90-5DP, Aluminum, alkoxides, reaction products with phosphoric acids and silicon oxide precursors 7440-67-7DP, Zirconium, alkoxides, reaction products with phosphoric acids and silicon oxide precursors 7664-38-2DP, Phosphoric acid, reaction products with **titanium** tetraisopropoxide and alkoxysilanes 82887-05-6DP, Diethylphosphatoethyltriethoxysilane, reaction product with phosphoric acid, **titanium** tetraisopropoxide, and tetraethoxysilane 126519-89-9DP, 2-(4-Chlorosulfonylphenyl)ethyltrimethoxysilane, reaction product with phosphoric acid, **titanium** tetraisopropoxide, and tetraethoxysilane
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- L379 ANSWER 12 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2005:75832 Document No. 142:138384 Hybrid organic-inorganic **proton conductors**, their manufacture, and membrane-electrode assemblies and **fuel cells** using them. Matsuo, Kazumine; Omichi, Takahiro (Teijin Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2005025943 A2 20050127, 29 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-186535 20030630.
- AB The **proton conductors** comprise organic polymer **proton conductors**, and inorg. **proton conductors** comprising condensates of 100 mol parts solid

acids, 450-20,000 mol parts Lewis acidic **metal** alkoxides, and Si oxide precursors, e.g., alkoxysilanes, where the organic and inorg. **proton conductors** form interpenetrating networks. In the manufacture, the solid acids were hydrolyzed and condensed with the alkoxides and the precursors in solvents, added to organic polymer **proton conductor** solns., and cast into **films**. The assemblies have the **proton conductors** sandwiched between catalyst electrodes containing **metals supported** on fine elec. conductive particles. The **proton conductors** show good flexibility, and oxidation and swelling resistance, resulting in **fuel cells** showing good dimensional stability.

IC ICM H01M008-02
ICS H01B001-06; H01B013-00; H01M004-86; H01M004-88; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 76

ST hybrid org inorg **proton conductor**
interpenetrating network **fuel cell**; solid acid
condensate **electrolyte fuel cell**;
Lewis acid **metal** alkoxide condensate **electrolyte**
fuel cell; alkoxysilane condensate
electrolyte fuel cell

IT **Metal** alkoxides
RL: DEV (Device component use); IMF (Industrial manufacture); PREP
(Preparation); USES (Uses)
(Lewis acidic, condensates with solid acids and silicon oxide
precursors; manufacture of hybrid organic-inorg. **proton**
conductors forming interpenetrating networks for
membrane-electrode assemblies for **fuel cells**)

IT **Fuel cell** electrodes
Fuel cell electrolytes
Fuel cells
Hybrid organic-inorganic materials
(manufacture of hybrid organic-inorg. **proton conductors**
forming interpenetrating networks for membrane-electrode
assemblies for **fuel cells**)

IT Heteropoly acids
RL: DEV (Device component use); IMF (Industrial manufacture); PREP
(Preparation); USES (Uses)
(molybdophosphoric, reaction products with Lewis acidic
metal alkoxides, and silicon oxide precursors; manufacture of
hybrid organic-inorg. **proton conductors** forming
interpenetrating networks for membrane-electrode assemblies for
fuel cells)

IT Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP
(Preparation); USES (Uses)
(polyether-, sulfonated, chlorided, reaction products with
ethylamine; manufacture of hybrid organic-inorg. **proton**
conductors forming interpenetrating networks for
membrane-electrode assemblies for **fuel cells**)

IT Polyketones
Polysulfones, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP
(Preparation); USES (Uses)
(polyether-, sulfonated; manufacture of hybrid organic-inorg.
proton conductors forming interpenetrating
networks for membrane-electrode assemblies for **fuel**
cells)

IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP
(Preparation); USES (Uses)
(polyketone-, sulfonated; manufacture of hybrid organic-inorg.
proton conductors forming interpenetrating
networks for membrane-electrode assemblies for **fuel**
cells)

- IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polysulfone-, sulfonated, chlorided, reaction products with ethylamine; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT Polyethers, uses
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(polysulfone-, sulfonated; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT Ionic conductors
(**protonic**; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT Heteropoly acids
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(tungstophosphoric, reaction products with **titanium tetraisopropoxide** and alkoxysilanes; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT Heteropoly acids
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(tungstosilicic, reaction products with tungstophosphoric acid, **titanium tetraisopropoxide** and alkoxysilanes; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT 7440-44-0, Carbon, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(elec. conductive particles, catalyst **supported on**; manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)
- IT 75-04-7DP, Ethylamine, reaction product with polyether-polyketone sulfonyl chlorides 78-10-4DP, Tetraethoxysilane, reaction products with solid acids and **titanium tetraisopropoxide** 546-68-9DP, **Titanium tetraisopropoxide**, reaction products with solid acids and alkoxysilanes 780-69-8DP, Phenyltriethoxysilane, reaction product with tungstophosphoric acid, **titanium tetraisopropoxide**, and tetraethoxysilane 7429-90-5DP, Aluminum, alkoxides, reaction products with solid acids and silicon oxide precursors 7440-67-7DP, Zirconium, alkoxides, reaction products with solid acids and silicon oxide precursors 7664-38-2DP, Phosphoric acid, reaction products with solid acids, **titanium tetraisopropoxide**, and tetraethoxysilane 11104-88-4DP, Molybdophosphoric acid, reaction product with Lewis acidic **metal** alkoxides, and silicon oxide precursors 12067-99-1DP, Tungstophosphoric acid, reaction products with **titanium tetraisopropoxide** and alkoxysilanes 13598-36-2DP, Phosphonic acid, reaction product with heteropoly acids, Lewis acidic **metal** alkoxides, and silicon oxide precursors 82887-05-6DP, Diethylphosphatoethyltriethoxysilane, reaction product with tungstophosphoric acid, **titanium tetraisopropoxide**, and tetraethoxysilane 126519-89-9DP, 2-(4-Chlorosulfonylphenyl)ethyltrimethoxysilane, reaction product with tungstophosphoric acid, **titanium tetraisopropoxide**, and tetraethoxysilane 827036-43-1DP, Silicon tungsten hydroxide oxide, reaction products with tungstophosphoric acid, **titanium tetraisopropoxide**, and alkoxysilanes

RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
 (manufacture of hybrid organic-inorg. **proton conductors** forming interpenetrating networks for membrane-electrode assemblies for **fuel cells**)

L379 ANSWER 13 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2005:16056 Document No. 142:117647 **Fuel cells** and their components using catalysts having a high **metal to support** ratio. Kourtakis, Kostantinos (E. I. du Pont de Nemours and Company, USA). PCT Int. Appl. WO 2005001978 A2 20050106, 36 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-US16707 20040527. PRIORITY: US 2003-PV475075 20030530.

AB The present invention relates to **coated** substrates comprising electrocatalysts containing at least about 70 weight% of a **metal**. The present invention also relates to **fuel cell** stacks and single cells, including direct methanol **fuels cells**, hydrogen **fuel cells**, and reformed hydrogen **fuel cells** comprising the **coated** substrate comprising electrocatalysts containing at least about 70 weight% of a **metal**.

IT 7440-05-3, **Palladium**, uses
 RL: CAT (Catalyst use); USES (Uses)
 (fuel cells and their components using catalysts having high **metal to support** ratio)

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST **fuel cell** catalyst high **metal support** ratio

IT Carbides
 Oxides (inorganic), uses
 RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)
 (composites; **fuel cells** and their components using catalysts having high **metal to support** ratio)

IT **Fuel cells**
 (direct methanol; **fuel cells** and their components using catalysts having high **metal to support** ratio)

IT Catalysts
 (electrocatalysts; **fuel cells** and their components using catalysts having high **metal to support** ratio)

IT Carbon fibers, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (fabrics; **fuel cells** and their components using catalysts having high **metal to support** ratio)

IT Conducting polymers
Fuel cells

- (fuel cells and their components using catalysts having high metal to support ratio)
- IT Transition metal carbides
RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)
(fuel cells and their components using catalysts having high metal to support ratio)
- IT Polymers, uses
RL: MOA (Modifier or additive use); USES (Uses)
(ion-exchange; fuel cells and their components using catalysts having high metal to support ratio)
- IT Metalloporphyrins
RL: CAT (Catalyst use); USES (Uses)
(iron; fuel cells and their components using catalysts having high metal to support ratio)
- IT Metalloporphyrins
RL: CAT (Catalyst use); USES (Uses)
(nickel; fuel cells and their components using catalysts having high metal to support ratio)
- IT Carbon fibers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(paper; fuel cells and their components using catalysts having high metal to support ratio)
- IT Sulfonic acids, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(perfluoro; fuel cells and their components using catalysts having high metal to support ratio)
- IT Perfluoro compounds
RL: TEM (Technical or engineered material use); USES (Uses)
(sulfonic acids; fuel cells and their components using catalysts having high metal to support ratio)
- IT Ion exchange membranes
(support; fuel cells and their components using catalysts having high metal to support ratio)
- IT 132-16-1, Iron phthalocyanine 3317-67-7, Cobalt phthalocyanine 7439-98-7, Molybdenum, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 7440-33-7, Tungsten, uses 12779-05-4 14055-02-8, Nickel phthalocyanine 15612-49-4, Cobalt porphyrin
RL: CAT (Catalyst use); USES (Uses)
(fuel cells and their components using catalysts having high metal to support ratio)
- IT 7440-44-0, Carbon, uses
RL: CAT (Catalyst use); TEM (Technical or engineered material use); USES (Uses)
(fuel cells and their components using catalysts having high metal to support ratio)
- L379 ANSWER 14 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:1036049 Document No. 142:25858 Direct-type polymer electrolyte fuel cell with anode containing oxidation catalyst. Yanase, Takanori; Iwasaki, Fumiharu; Tamachi, Tsuneaki; Sarada, Takashi; Furuta, Kazuyoshi (Seiko Instruments, Inc., Japan). Jpn. Kokai Tokkyo Koho JP 2004342435 A2 20041202, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2003-136905 20030515.
- AB The claimed fuel cell is equipped with an anode containing an electrochem. oxidation catalyst for a metal complex hydride fuel, where the catalyst decomp. the fuel to give a

cation and oxidizes a byproduct H gas to give H₂O. The anode catalyst may contain (1) Co and/or a H-absorbing alloy and Ni, Pd, and/or Pt or (2) C-supported Ni, Pd, and/or Pt. The fuel cell provides suppressed generation of H gas reaction products and improved handling property of fuels, e.g., NaBH₄.

IT 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (catalyst; anode catalyst for direct borohydride polymer electrolyte fuel cell)
 RN 7440-02-0 HCAPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-90
 ICS H01M004-86; H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 67
 ST anode oxidn catalyst direct borohydride polymer electrolyte fuel cell
 IT Fuel cell anodes
 Oxidation catalysts
 (anode catalyst for direct borohydride polymer electrolyte fuel cell)
 IT Fuel cells
 (polymer electrolyte; anode catalyst for direct borohydride polymer electrolyte fuel cell)
 IT 16940-66-2, Sodium tetrahydroborate
 RL: TEM (Technical or engineered material use); USES (Uses)
 (anode catalyst for direct borohydride polymer electrolyte fuel cell)
 IT 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-48-4, Cobalt, uses 799854-37-8
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (catalyst; anode catalyst for direct borohydride polymer electrolyte fuel cell)

L379 ANSWER 15 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:1020207 Document No. 142:9228 Solid oxide fuel cell and method for producing same. Shibutani; Satoshi; Okada, Yukihiro; Yuasa, Kohji; Taniguchi, Noboru; Mino, Norihisa; Niikura, Junji (Matsushita Electric Industrial Co., Ltd., Japan).
 PCT Int. Appl. WO 2004102704 A1 20041125, 53 pp. DESIGNATED STATES:
 W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2004-JP6772 20040513. PRIORITY: JP 2003-136344 20030514.

AB A solid oxide fuel cell is disclosed which is excellent in electricity generation characteristics even at lower temps. (for example, in the range from 200°C to 600°C, preferably in the range from 400°C to 600°C). A method for producing such a solid oxide fuel cell is also disclosed. The solid oxide fuel cell comprises an anode, a cathode, and a first solid oxide which is held between the anode and the cathode. The anode contains a metal particle (2), an anode catalyst (1) and an ion conductor (3), and the anode catalyst (1) is adhered to the surface of the metal particle (2). The first solid oxide and the ion conductor (3) resp. have an ion conductivity selected from oxide-ion conductivity and hydrogen-ion conductivity

IT 7440-02-0, Nickel, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst support for metal catalysts for fuel cells)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IT 386720-65-6, Barium cerium gadolinium zirconium oxide (BaCe_{0.2}Gd_{0.2}Zr_{0.6}O₃)
 RL: TEM (Technical or engineered material use); USES (Uses)
 (ion conductors for fuel cells)

RN 386720-65-6 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.2}Gd_{0.2}Zr_{0.6}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.6	7440-67-7
Gd	0.2	7440-54-2
Ce	0.2	7440-45-1
Ba	1	7440-39-3

IT 7440-05-3, Palladium, uses 7440-22-4, Silver, uses
 RL: CAT (Catalyst use); USES (Uses)
 (nickel supported catalysts for fuel cells)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IC ICM H01M004-86

ICS H01M004-88; H01M008-02; H01M008-12

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST ion conductive metal oxide fuel
cell anode catalyst

IT Ionic conductors
(solid oxide fuel cells containing metal
oxide type)

IT Catalysts
(solid oxide fuel cells containing metal
-supported)

IT Fuel cells
(solid oxide; metal oxide ion
conductors and catalysts form)

IT 7440-02-0, Nickel, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst support for metal catalysts for
fuel cells)

IT 162105-72-8, Cerium samarium oxide (Ce_{0.8}Sm_{0.2}O₂) 183546-68-1,
Cerium gadolinium oxide (Ce_{0.9}Gd_{0.1}O₂) 258347-94-3, Cerium
lanthanum oxide (Ce_{0.9}La_{0.1}O₂) 386720-65-6, Barium
cerium gadolinium zirconium oxide (BaCe_{0.2}Gd_{0.2}Zr_{0.6}O₃)
797816-90-1
RL: TEM (Technical or engineered material use); USES (Uses)
(ion conductors for fuel
cells)

IT 7439-88-5, Iridium, uses 7439-89-6, Iron, uses
7440-05-3, Palladium, uses 7440-06-4, Platinum,
uses 7440-16-6, Rhodium, uses 7440-22-4, Silver
, uses 7440-48-4, Cobalt, uses 7440-57-5, Gold, uses
12714-36-2 37365-43-8 39361-20-1 77491-76-0 252010-68-7
RL: CAT (Catalyst use); USES (Uses)
(nickel supported catalysts for fuel
cells)

L379 ANSWER 16 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:965172 Document No. 141:368468 Manufacture of metal
hydrides and their use for hydrogen storage in fuel cells.
Edwards, Peter Philip; Grochala, Wojciech; Book, David; Harris, Ivor
Rex (Isis Innovation Limited, UK). PCT Int. Appl. WO 2004/096700 A1
20041111, 21 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ,
BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS,
JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,
MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD,
SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN,
YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK,
ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN,
TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-GB1579
20040413. PRIORITY: GB 2003-8253 20030410.

AB Metal hydrides are produced by mech. grinding or
milling an oxide or halide of a 1st metal with a
hydride of a 2nd metal, especially NaH, NaBH₄, or
LiAlH₄. The reacting particles have a particle size of ≤ 50
.μm, preferably 5-40 .μm
. The produced metal hydride can be used for
hydrogen storage to supply hydrogen fuel to fuel
cells, especially polymeric-electrolyte-membrane or alkaline
fuel cells. An elec. energy generating system
consists of a hydrogen fuel cell having an inlet
for hydrogen gas; and a storage vessel containing the solid
metal hydride material being connected to the
inlet of the hydrogen fuel cell, wherein the
solid metal hydride material thermally decomp.
to release hydrogen gas at a temperature within the operating
range of the hydrogen fuel cell
(60-120°). The hydrogen storage material can be Zn(BH₄)₂,
NaBH₄, MgH₂, and/or AlH₃.

IC ICM C01B006-00

ICS C01B006-21; H01M008-06; B60L011-18
CC 52-3 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **metal hydride** zinc borohydride manuf hydrogen
storage fuel cell
IT Fuel cells
(alkaline fuel cells; manufacture of **metal hydrides**
and their use for hydrogen storage in fuel cells)
IT Ball milling
(manufacture of **metal hydrides** and their use for
hydrogen storage in fuel cells)
IT **Fuel cells**
(polymer **electrolyte**; manufacture of **metal**
hydrides and their use for hydrogen storage in
fuel cells)
IT 17611-70-0P, Zinc borohydride
RL: CPS (Chemical process); IMF (Industrial manufacture); NUU (Other
use, unclassified); PEP (Physical, engineering or chemical process);
PREP (Preparation); PROC (Process); USES (Uses)
(manufacture of **metal hydrides** and their use for
hydrogen storage in fuel cells)
IT 7693-27-8, Magnesium **hydride** (MgH₂) 7784-21-6, Aluminum
hydride (AlH₃)
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP
(Physical, engineering or chemical process); PROC (Process); USES
(Uses)
(manufacture of **metal hydrides** and their use for
hydrogen storage in fuel cells)
IT 1314-13-2, Zinc oxide, reactions 7646-85-7, Zinc chloride,
reactions 16940-66-2, Sodium borohydride
RL: CPS (Chemical process); PEP (Physical, engineering or chemical
process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(manufacture of **metal hydrides** and their use for
hydrogen storage in fuel cells)

L379 ANSWER 17 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:934657 Document No. 141:398175 **Metal-supported**

porous carbon **films** as **fuel cell**

electrodes. Ohya, Shyusei; Fujii, Yuuichi; Matsuo, Makoto; Takagi,
Jun (Ube Industries, Ltd., Japan). PCT Int. Appl. WO 2004095614 A2
20041104, 27 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ,
BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS,
KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,
MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE,
SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU,
ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES,
FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD,
TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-JP5092
20040408. PRIORITY: JP 2003-113978 20030418.

AB The invention concerns a **metal-supported** porous
carbon **film** wherein **metal** fine particles with a
mean particle diameter of 0.7-20 nm are dispersed and **supported**
on pore **surface walls**, **fuel cell**
electrodes employing the **metal-supported** porous
carbon **film**, a membrane-electrode assembly comprising the
fuel cell electrodes bonded on both **sides**
of a polymer **electrolyte film**, and a
fuel cell comprising the **fuel**
cell electrode as a constituent element. The
support structure is such that **metal** fine
particles having a controlled particle size are uniformly
supported to allow effective utilization of the
metal-based catalyst, and the fabrication steps are simple.

IT 7440-05-3, **Palladium**, uses 7440-05-3D,
Palladium, compound
RL: CAT (Catalyst use); USES (Uses)

(metal-supported porous carbon films
as fuel cell electrodes)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-88
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST **fuel cell electrode metal**
supported porous carbon film
IT Polyimides, uses
RL: DEV (Device component use); USES (Uses)
(carbonized product; **metal-supported porous**
carbon films as fuel cell
electrodes)
IT Polyoxyalkylenes, uses
RL: MOA (Modifier or additive use); USES (Uses)
(fluorine- and sulfo-containing, **ionomers; metal-**
supported porous carbon films as fuel
cell electrodes)
IT **Fuel cell electrodes**
(**metal-supported porous carbon films**
as fuel cell electrodes)
IT **Metals, uses**
RL: TEM (Technical or engineered material use); USES (Uses)
(**metal-supported porous carbon films**
as fuel cell electrodes)
IT Fluoropolymers, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, **ionomers;**
metal-supported porous carbon films
as fuel cell electrodes)
IT **Ionomers**
RL: MOA (Modifier or additive use); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing; **metal-**
supported porous carbon films as fuel
cell electrodes)
IT 7440-05-3, **Palladium**, uses 7440-05-3D,
Palladium, compound
RL: CAT (Catalyst use); USES (Uses)
(**metal-supported porous carbon films**
as fuel cell electrodes)
IT 7440-06-4, **Platinum**, uses 7440-44-0, **Carbon**, uses
RL: DEV (Device component use); USES (Uses)
(**metal-supported porous carbon films**
as fuel cell electrodes)
IT 785808-93-7, **Nafion 11**
RL: MOA (Modifier or additive use); USES (Uses)
(**metal-supported porous carbon films**
as fuel cell electrodes)
IT 785785-69-5, **TPX 205MU** 785785-70-8, **TPX 205R**
RL: TEM (Technical or engineered material use); USES (Uses)
(**metal-supported porous carbon films**
as fuel cell electrodes)
IT 7782-42-5, **Graphite**, uses

RL: TEM (Technical or engineered material use); USES (Uses)
 (support; metal-supported porous
 carbon films as fuel cell
 electrodes)

L379 ANSWER 18 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:898951 Document No. 141:368429 Unit cell structure for
 fuel cell, and its use in solid oxide fuel
 cell. Hara, Naoki; Takeuchi, Kazushi; Shibata, Itaru
 (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP
 2004303508 A2 20041028, 16 pp. (Japanese). CODEN: JKXXAF.
 APPLICATION: JP 2003-93400 20030331.

AB The unit cell structure has a metal sheet
 sandwiched between 2 unit cells. The unit cell has battery
 components or an electrolyte layer and an anode
 or cathode layer on upper side of a
 metal support having (1) ≥ 1 pore with
 opening at upper and lower sides or (2) ≥ 1
 depressed section at lower side and pores at the depressed
 section bottom. The same kind electrode layers (i.e.,
 anode to anode, cathode to cathode) of the 2 unit cells are
 faced through the metal sheet, and the
 sheet has ≥ 1 hole penetrating through upper and lower
 sides. Preferably, the metal support
 contains Fe, Ni, and/or Cu. The
 fuel cell has a stack of the unit cell structure,
 wherein an insulating part is placed at the metal
 support and/or the metal sheet, and each
 unit cell structure has current collectors at the anode side
 and the cathode side. The unit cell structure with high
 reliability of the same electrode faced part gives a
 small-sized lightwt. fuel cell.

IT 7440-02-0, Nickel, uses 7440-50-8,
 Copper, uses

RL: DEV (Device component use); USES (Uses)
 (support containing; unit cell structure with metal
 sheet sandwiched between two unit cells on metal
 supports for solid oxide fuel cell)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT 7440-22-4, Silver, uses

RL: DEV (Device component use); USES (Uses)
 (support; unit cell structure with metal
 sheet sandwiched between two unit cells on metal
 supports for solid oxide fuel cell)

RN 7440-22-4 HCAPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IC ICM H01M008-02

ICS H01M008-12; H01M008-24

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST solid oxide fuel cell unit cell
 structure; metal support sheet unit
 cell structure fuel cell

IT Electric insulators
 (ceramic, fuel cell component; unit cell
 structure with metal sheet sandwiched between
 two unit cells on metal supports for solid
 oxide fuel cell)

IT Fuel cells
 (solid oxide; unit cell structure with metal
 sheet sandwiched between two unit cells on metal
 supports for solid oxide fuel cell)

IT 11109-52-7, SUS 430 39323-81-4, Invar
 RL: DEV (Device component use); USES (Uses)
 (sheet, current collector; unit cell structure with
 metal sheet sandwiched between two unit cells
 on metal supports for solid oxide
 fuel cell)

IT 12606-02-9, Inconel 39362-79-3, 42 Alloy
 RL: DEV (Device component use); USES (Uses)
 (sheet, support; unit cell structure with
 metal sheet sandwiched between two unit cells
 on metal supports for solid oxide
 fuel cell)

IT 7439-89-6, Iron, uses 7440-02-0, Nickel
 , uses 7440-50-8, Copper, uses
 RL: DEV (Device component use); USES (Uses)
 (support containing; unit cell structure with metal
 sheet sandwiched between two unit cells on metal
 supports for solid oxide fuel cell)

IT 7440-22-4, Silver, uses
 RL: DEV (Device component use); USES (Uses)
 (support; unit cell structure with metal
 sheet sandwiched between two unit cells on metal
 supports for solid oxide fuel cell)

L379 ANSWER 19 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:820264 Document No. 141:317228 Fuel cell
 units and their manufacture. Takeuchi, Kazushi; Hara, Naoki;
 Shibata, Itaru (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo
 Koho JP 2004281172 A2 20041007, 14 pp. (Japanese). CODEN: JKXXAF.
 APPLICATION: JP 2003-69480 20030314.

AB The fuel cell units have an electrolyte
 and an anode layer or a cathode layer on a
 metal support, where the metal
 support has a recessed area of any pattern on the opposite
 side from the electrolyte layer, a
 porous area at the bottom of the recessed area, and a porous gas
 permeable reinforcing member at the bottom of the recessed area,.
 The support is a metal containing Fe,
 Ni, Cu, Cr, Mo, and/or W. The units are
 prepared by forming the electrolyte layer and the
 electrode layer successively on the metal
 support, forming the recessed area on the backside of the
 support, making the bottom part of the recessed area porous,
 and adding the gas permeable reinforcing member to the bottom.

IT 7440-02-0, Nickel, uses
 RL: DEV (Device component use); PEP (Physical, engineering or
 chemical process); PYP (Physical process); PROC (Process); USES
 (Uses)
 (structure and manufacture of fuel cell units
 containing metal supports having recessed areas
 with porous bottoms and gas permeable reinforcing members)

RN 7440-02-0 HCAPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M004-86
ICS H01M004-88; H01M008-02; H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell metal separator structure**
manuf
IT **Fuel cells**
(structure and manufacture of **fuel cell** units
containing **metal supports** having recessed areas
with porous bottoms and gas permeable reinforcing members)
IT 1344-28-1, Alumina, uses 7440-02-0, **Nickel**, uses
7440-18-8, Ruthenium, uses 12605-84-4, Hastelloy B 12606-02-9,
Inconel 39362-79-3, 42 Alloy 113482-02-3, Yttrium
zirconium oxide (Y0.06Zr0.97O2.03) 114168-16-0, Yttrium zirconium
oxide (Y0.16Zr0.92O2.08)
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); PROC (Process); USES
(Uses)
(structure and manufacture of **fuel cell** units
containing **metal supports** having recessed areas
with porous bottoms and gas permeable reinforcing members)

L379 ANSWER 20 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:803048 Document No. 141:317212 **Fuel cell**.

Taniguchi, Noboru (Matsushita Electric Industrial Co., Ltd., Japan).

PCT Int. Appl. WO 2004084332 A1 20040930, 45 pp. DESIGNATED

STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ,
CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB,
GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO,
NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE,
BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE,
IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (Japanese).
CODEN: PIXXD2. APPLICATION: WO 2004-JP3392 20040315. PRIORITY: JP
2003-72702 20030317.

AB The **fuel cell** comprises an **electrolyte**
between an anode and a cathode, a fuel supply part supplying a fuel
to the anode, an oxidizing agent supply part supplying an O containing
oxidizing agent to the cathode, and a heating part heating the
fuel cell; where the **electrolyte** is made
of a solid oxide; and the fuel is liquid or solid at ordinary
temperature and normal pressure.

IT 386720-65-6D, Barium cerium gadolinium zirconium oxide
(BaCe0.2Gd0.2Zr0.6O3), O deficient 632286-96-5D, Barium
cerium gadolinium zirconium oxide (BaCe0.24Gd0.24Zr0.52O3), O
deficient 632286-97-6D, Barium cerium gadolinium zirconium
oxide (BaCe0.24Gd0.2Zr0.56O3), O deficient
RL: DEV (Device component use); USES (Uses)
(**fuel cells** containing heating means and solid
oxides in **electrolytes**)

RN 386720-65-6 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.2Zr0.6O3) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.6	7440-67-7
Gd	0.2	7440-54-2
Ce	0.2	7440-45-1

Ba | 1 | 7440-39-3

RN 632286-96-5 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.24}Gd_{0.24}Zr_{0.52}O₃)
(9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.52	7440-67-7
Gd	0.24	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

RN 632286-97-6 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.24}Gd_{0.2}Zr_{0.56}O₃)
(9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.56	7440-67-7
Gd	0.2	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

IC ICM H01M008-02

ICS H01M008-04; H01M008-06; H01M008-12

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST fuel cell structure heating means

electrolyte solid oxide

IT Fuel cell electrolytes

Fuel cells

(fuel cells containing heating means and solid
oxides in electrolytes)

IT 7440-06-4, Platinum, uses

RL: CAT (Catalyst use); USES (Uses)

(fuel cells containing heating means and solid
oxides in electrolytes)

IT 64-17-5, Ethanol, uses 67-56-1, Methanol, uses 71-23-8, Propyl
alcohol, uses 71-36-3, Butyl alcohol, uses 106-97-8, Butane,
uses 144378-46-1D, Barium cerium gadolinium oxide
(BaCe_{0.8}Gd_{0.2}O₃), O deficient 288865-89-4D, Barium cerium yttrium
zirconium oxide (BaCe_{0.4}Y_{0.2}Zr_{0.4}O₃), O deficient 288866-24-0D,
Barium cerium indium zirconium oxide (BaCe_{0.4}In_{0.2}Zr_{0.4}O₃), O
deficient 288866-28-4D, Barium cerium indium zirconium oxide
(BaCe_{0.5}In_{0.2}Zr_{0.3}O₃), O deficient 386720-65-6D, Barium
cerium gadolinium zirconium oxide (BaCe_{0.2}Gd_{0.2}Zr_{0.6}O₃), O deficient
632286-92-1D, Barium cerium ytterbium zirconium oxide
(BaCe_{0.4}Yb_{0.2}Zr_{0.4}O₃), O deficient 632286-93-2, Aluminum barium
cerium gadolinium oxide (Al_{0.02}BaCe_{0.8}Gd_{0.2}O₃) 632286-94-3D,
Aluminum barium cerium indium zirconium oxide
(Al_{0.02}BaCe_{0.4}In_{0.2}Zr_{0.4}O₃), O deficient 632286-96-5D,
Barium cerium gadolinium zirconium oxide (BaCe_{0.24}Gd_{0.24}Zr_{0.52}O₃), O
deficient 632286-97-6D, Barium cerium gadolinium zirconium
oxide (BaCe_{0.24}Gd_{0.2}Zr_{0.56}O₃), O deficient 632286-98-7D, O
deficient 767287-96-7D, O deficient
RL: DEV (Device component use); USES (Uses)
(fuel cells containing heating means and solid
oxides in electrolytes)

L379 ANSWER 21 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:788704 Document No. 142:184185 Process for preparation of
supported platinum and Pt-based multi-element catalyst

- organic sol. Tang, Yawen; Lu, Tianhong; Yang, Hui (Nanjing Normal University, Peop. Rep. China). Faming Zhuanli Shenqing Gongkai Shuomingshu CN 1410160 A 20030416, 7 pp. (Chinese). CODEN: CNXXEV. APPLICATION: CN 2002-138658 20021126.
- AB The title process comprises the following steps of (1) dissolving Pt and Pt-based multi-element **salt** or acid compound into organic solvent, adding organic solution of SnCl_2 under stirring, allowing to react for 5 min to obtain organic sol of the **metal salt**; (2) adding **support** to the component A at -25 - 65°C , allowing to react under N_2 protection; and (3) washing with NaOH or Na_2CO_3 solution, acid and water till no **Cl ion** is detectable, and drying at 60 - 150°C to obtain the catalyst. The other **metal** is from Ru, Ir, Rh or Os; and the **support** from activated carbon, carbon black or mol. sieve. This catalyst is used in proton-exchange membrane **fuel cell**.
- IT 7772-99-8, Tin dichloride, uses
 RL: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or reagent);
 USES (Uses)
 (preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)
- RN 7772-99-8 HCAPLUS
 CN Tin chloride (SnCl_2) (8CI, 9CI) (CA INDEX NAME)

Cl-Sn-Cl

- IC ICM B01J023-42
 ICS B01J037-02
- CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
 Section cross-reference(s): 52
- IT Redox reaction catalysts
 (preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)
- IT Carbon black, uses
 RL: CAT (Catalyst use); USES (Uses)
 (preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)
- IT Fuel cells
 (proton exchange membrane; preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)
- IT 7440-44-0, Activated carbon, uses
 RL: CAT (Catalyst use); USES (Uses)
 (activated; preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)
- IT 7439-88-5, Iridium, uses 7440-04-2, Osmium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)
- IT 7772-99-8, Tin dichloride, uses 16941-12-1, Chloroplatinic acid
 RL: CAT (Catalyst use); RCT (Reactant); RACT (Reactant or reagent);
 USES (Uses)
 (preparation of **supported** platinum and Pt-based multi-element catalyst organic sol for proton-exchange membrane fuel cell.)

L379 ANSWER 22 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:584211 Document No. 141:413488 **Metal-supported**

solid oxide fuel cells for operation at
temperatures of 500-650.degree.C.

Atkinson, A.; Baron, S.; Brandon, N. P.; Esquirol, A.; Kilner, J. A.; Oishi, N.; Rudkin, R.; Steele, B. C. H. (Centre for Ion Conducting Membranes, Imperial College London, SW7 2BP, UK). Fuel Cell Science, Engineering and Technology, International Conference on Fuel Cell Science, Engineering and Technology, 1st, Rochester, NY, United States, Apr. 21-23, 2003, Meeting Date 2003, 499-506. Editor(s): Shah, Ramesh K.; Kandlikar, S. G. American Society of Mechanical Engineers: New York, N. Y. ISBN: 0-7918-3668-1 (English) 2003. CODEN: 69FQKI.

AB Innovative intermediate **temperature** solid oxide fuel **cells** were developed which involved the fabrication of a thick-film PEN structure **supported** on a ferritic stainless steel substrate. Use of a **metal support** enables a robust structure to be fabricated which can withstand stresses during operation. It is possible to arrange a processing schedule that allows the deposited **electrolyte** powder to be sintered into an impermeable thick **film** (10-20 .mu.m) at .apprx.1000°. This relatively low sintering **temperature** is compatible with the mech. integrity of the stainless steel **support**. An anode **film** is initially deposited on the **metal support** followed by deposition of the **electrolyte** powder. Much of the initial development work was carried out using ceria-based **electrolytes**. The cell is completed by depositing a cathode. Results are presented on the development and characterization of anode and cathode materials with a discussion on cell development.

IT 7440-02-0, **Nickel**, uses

RL: DEV (Device component use); USES (Uses)

(composite material containing cerium gadolinium oxide and; stainless steel-**supported SOFCs** for operation at 500-650°)

RN 7440-02-0 HCAPLUS

CN **Nickel** (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST stainless steel **support** solid oxide fuel **cell**

IT **Fuel cells**

(solid oxide; stainless steel-**supported SOFCs** for operation at 500-650°)

IT 61162-99-0, Cobalt **iron lanthanum** strontium oxide

RL: DEV (Device component use); USES (Uses)

(cathode; in stainless steel-**supported SOFCs** for operation at 500-650°)

IT 152233-89-1, Cerium gadolinium oxide (Ce0.9Gd0.101.95)

RL: DEV (Device component use); USES (Uses)

(composite material containing **Ni** and; in stainless steel-**supported SOFCs** for operation at 500-650°)

IT 7440-02-0, **Nickel**, uses

RL: DEV (Device component use); USES (Uses)

(composite material containing cerium gadolinium oxide and; stainless steel-**supported SOFCs** for operation at 500-650°)

IT 152233-89-1D, Cerium gadolinium oxide (Ce0.9Gd0.101.95),

oxygen-deficient
RL: DEV (Device component use); USES (Uses)
(electrolyte; in stainless steel-supported
SOFCs for operation at 500-650°)

IT 12597-68-1, Stainless steel, uses
RL: DEV (Device component use); USES (Uses)
(ferritic; stainless steel-supported SOFCs
for operation at 500-650°)

L379 ANSWER 23 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:552141 Document No. 141:74332 Compact fuel cell having system for
dehydrogenation of organic **hydrides** inside for efficient
power generation. Ichikawa, Masaru; Sasazu, Hiroshi; Suzuki,
Fumihiko (Electric Power Development Co., Ltd., Japan). Jpn. Kokai
Tokkyo Koho JP 2004192834 A2 20040708, 11 pp. (Japanese). CODEN:
JKXXAF. APPLICATION: JP 2002-356074 20021206.

AB The fuel cell consists of a cathode reactor
filled with an oxidizing agent, an anode reactor having a holder for
organic **hydrides**, a dehydrogenation catalyst, and a heater,
sealed with a H separator membrane, and an ion-exchange
membrane between a cathode current collector and an anode current
collector, each having a Pt catalyst, wherein H ion is
formed by dehydrogenation of organic **hydrides**, separation of the
resulting H with the H separator membrane, and ionization
of the H in contact with the Pt catalyst supported on the
anode current collector, and passed through the ion
-exchange membrane for reaction with O ion in the cathode
reactor.

IT 7439-89-6, Iron, uses 7440-02-0,
Nickel, uses 7440-05-3, Palladium, uses
7440-47-3, Chromium, uses 7440-50-8,
Copper, uses 7440-62-2, Vanadium, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(compact fuel cell having system for dehydrogenation of organic
hydrides inside)

RN 7439-89-6 HCAPLUS
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

RN 7440-62-2 HCAPLUS
 CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM H01M008-04
 ICS H01M008-06; H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST fuel cell org **hydride** dehydrogenation catalyst hydrogen;
 isopropanol hydrogenation oxygen fuel cell platinum catalyst
 IT Carbon fibers, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (activated; compact fuel cell having system for dehydrogenation
 of organic **hydrides** inside)
 IT Polymers, uses
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); TEM (Technical or engineered material use); PROC
 (Process); USES (Uses)
 (aromatic, hydrogenated; compact fuel cell having system for
 dehydrogenation of organic **hydrides** inside)
 IT Nanotubes
 (carbon; compact fuel cell having system for dehydrogenation of
 organic **hydrides** inside)
 IT Catalyst **supports**
 Dehydrogenation catalysts
 Fuel cells
 Heaters
 (compact fuel cell having system for dehydrogenation of organic
hydrides inside)
 IT Fullerenes
 Zeolites (synthetic), uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (compact fuel cell having system for dehydrogenation of organic
hydrides inside)
 IT Aromatic compounds
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); TEM (Technical or engineered material use); PROC
 (Process); USES (Uses)
 (hydrogenated; compact fuel cell having system for
 dehydrogenation of organic **hydrides** inside)
 IT Porous materials
 (**mesoporous**; compact fuel cell having system for
 dehydrogenation of organic **hydrides** inside)
 IT **Hydrides**
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); TEM (Technical or engineered material use); PROC
 (Process); USES (Uses)
 (organic; compact fuel cell having system for dehydrogenation of
 organic **hydrides** inside)
 IT 1314-23-4, Zirconia, uses 1344-28-1, Alumina, uses 7439-88-5,
 Iridium, uses 7439-89-6, Iron, uses 7439-98-7,
 Molybdenum, uses 7440-02-0, Nickel, uses
 7440-05-3, Palladium, uses 7440-06-4, Platinum,
 uses 7440-15-5, Rhenium, uses 7440-16-6, Rhodium, uses
 7440-18-8, Ruthenium, uses 7440-33-7, Tungsten, uses
 7440-47-3, Chromium, uses 7440-48-4, Cobalt,
 uses 7440-50-8, Copper, uses 7440-62-2
 , Vanadium, uses 7631-86-9, Silica, uses 13463-67-7,
 Titania, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)

- (compact fuel cell having system for dehydrogenation of organic hydrides inside)
- IT 1333-74-0P, Hydrogen, preparation
 RL: CPS (Chemical process); IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
 (compact fuel cell having system for dehydrogenation of organic hydrides inside)
- IT 64-17-5, Ethanol, uses 67-63-0, Isopropanol, uses 71-36-3, Butyl alcohol, uses 7722-84-1, Hydrogen peroxide, uses 7782-44-7, Oxygen, uses
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (compact fuel cell having system for dehydrogenation of organic hydrides inside)
- IT 7440-44-0, Carbon, uses
 RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
 (nanotubes; compact fuel cell having system for dehydrogenation of organic hydrides inside)
- L379 ANSWER 24 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:545609 Document No. 142:338902 Characteristics of anode-supported flat tubular solid oxide fuel cell. Kim, Jong-Hee; Song, Rak-Hyun (Hydrogen Fuel Cells Research Department, Korea Institute of Energy Research, Daejeon, 305-343, S. Korea). Journal of the Korean Electrochemical Society, 7(2), 94-99 (Korean) 2004. CODEN: JKESFC. ISSN: 1229-1935. Publisher: Korean Electrochemical Society.
- AB Anode-supported flat tubular solid oxide fuel cells (SOFC) were studied for an increase of the cell power d. The anode-supported flat tube was fabricated by extrusion. The porosity and pore size of Ni/YSZ (8 mol% yttria-stabilized zirconia) cermet anode were 50.6% and 0.23 μm , resp. The Ni particles in the anode were distributed uniformly and connected well to other particles in the cermet anode. The YSZ electrolyte layer and multilayered cathode composed of LSM ((La_{0.85}Sr_{0.15})_{0.9}MnO₃)/YSZ composite, LSM, and LSCF(La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O₃) were coated onto the anode substrate by slurry dip coating. The anode-supported flat tubular cell showed a performance of 300 mW/cm² (0.6 V, 500 mA/cm²) at 800°. The electrochem. characteristics of the flat tubular cell were examined by a.c. impedance and humidified fuel enhanced cell performance. The areal sp. resistance of LSM-coated (slurry dipping) steel, SUS430, as metallic interconnect, was 148 m Ω ·cm² at 750° and then decreased to 43 m Ω ·cm² after 450 h. However LSM-coated (slurry dipping) FeCrAlloy had a high area sp. resistance.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST anode supported flat tubular solid state fuel cell
 IT Fuel cells
 (solid electrolyte, tubular; characteristics of anode-supported flat-tubular solid oxide fuel cells)
- IT 185227-83-2
 RL: DEV (Device component use); USES (Uses)
 (anode; characteristics of anode-supported flat-tubular solid oxide fuel cells)
- IT 148595-66-8, Cobalt iron lanthanum strontium oxide (Co_{0.2}Fe_{0.8}La_{0.6}Sr_{0.4}O₃) 149372-30-5, Lanthanum manganese strontium oxide (La_{0.76}MnSr_{0.14}O₃)
 RL: DEV (Device component use); USES (Uses)
 (cathode containing; characteristics of anode-supported flat-tubular solid oxide fuel cells)

FT 114168-16-0, Yttrium zirconium oxide (Y0.16Zr0.92O2.08)

RL: DEV (Device component use); USES (Uses)
(electrolyte; characteristics of anode-supported flat-tubular solid oxide fuel cells)

IT 11109-52-7, SUS430 58719-23-6, Fecralloy

RL: DEV (Device component use); USES (Uses)
(interconnect; characteristics of anode-supported flat-tubular solid oxide fuel cells)

L379 ANSWER 25 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:532102 Document No. 141:150136 Nafion based amperometric hydrogen sensor. Velayutham, G.; Ramesh, C.; Murugesan, N.; Manivannan, V.; Dhathathreyan, K. S.; Periaswami, G. (Centre For Electrochemical & Energy Research, SPIC Science Foundation, Chennai, 600 032, India). Ionics, 10(1 & 2), 63-67 (English) 2004. CODEN: IONIFA. ISSN: 0947-7047. Publisher: Institute for Ionics.

AB A Nafion based amperometric H sensor that operates at room temperature was developed. The electrolyte used in the sensor is Nafion 117, which is a proton conducting solid polymer electrolyte. Pd catalyst was used on the sensing side and Pt supported on C on the air side. The sensor functions as fuel cell, H₂/Pd // Nafion // Pt/O₂ and the short circuit current is measured. The short circuit current is linear with respect to concentration of H on the sensing side. The sensor is able to detect the concentration of H in Ar down to ppb level. Details of assembly of the sensor, response behavior and applications are discussed.

CC 79-2 (Inorganic Analytical Chemistry)
Section cross-reference(s): 72

L379 ANSWER 26 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:507627 Document No. 141:56590 Hydrogen-permeable alloy membrane, and hydrogen-permeable component and production of same.. Ando, Isao (Sumitomo Metal Mining Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2004174373 A2 20040624, 12 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-343547 20021127.

AB The H-permeable alloy membrane is metal membrane containing face centered cubic crystalline structure Pd or Pd alloy as main composition and B 1-20 atomic%, and it is characterized by having face centered cubic crystalline structure lattice constant (room temperature) ≥ 0.390 nm. The Pd alloy may further contain Cu, Ag and/or Au 0-50 atomic%. The Pd alloy may also contain Y and/or lanthanoid element 0-10 atomic%. The H-permeable component is provided by forming the H-permeable alloy membrane on a gas-permeable porous metal (e.g., SUS316L) support. The production method includes forming the H-permeable alloy membrane on a gas-permeable porous metal support by ion plating, sputtering, applying alloy slurry, electroless plating or electroplating, or alloy rolling, etc. The H-permeable alloy membrane and H-permeable component can be used for purification/separation of H from gas mixture, and the purified/separated H can be used for fuel cells.

IT 7440-05-3, Palladium, properties

RL: DEV (Device component use); NUU (Other use, unclassified); PRP (Properties); USES (Uses)

(membrane containing; hydrogen-permeable alloy membrane and hydrogen-permeable component and production of same)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM B01D071-02
ICS B01D053-22; B22F003-11; C01B003-56; C22C001-08; C22C005-04;
C23C014-14; C23C014-32; C23C014-34; H01M008-06

CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52

ST hydrogen permeable **alloy** membrane; component hydrogen permeable prodn; **fuel cell** hydrogen permeable **alloy** membrane component

IT Membranes, nonbiological
(**alloy**, hydrogen-permeable; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT **Coating process**
(electroless; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT Vapor deposition process
(electron-beam; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT Crystal structure types
(face centered cubic, of **palladium Pd Ag B**; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT Electrodeposition
Rolling (**metals**)
Sputtering
(hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT **Fuel cells**
(hydrogen-permeable **alloy** membrane and hydrogen-permeable component for purification/separation of hydrogen for)

IT Vapor deposition process
(ion plating; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT **Alloys, properties**
RL: DEV (Device component use); NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(membrane, hydrogen-permeable; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT Vapor deposition process
(vacuum; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT **Palladium alloy, base**
RL: DEV (Device component use); NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(membrane containing; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT **7440-05-3, Palladium, properties**
RL: DEV (Device component use); NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(membrane containing; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT 39309-40-5 86511-28-6, **Palladium alloy, Pd,B** 706809-22-5 706809-23-6
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(membrane, hydrogen-permeable; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT 11134-23-9, **SUS316L**
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(porous **support**; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same)

IT 1333-74-0, **Hydrogen, processes**
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(purification/separation of; hydrogen-permeable **alloy** membrane and hydrogen-permeable component and production of same for)

- L379 ANSWER 27 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:484924 Document No. 141:280243 Effect of CeO₂ interlayer on ZrO₂ electrolyte/La(Sr)CoO₃ cathode for low-temperature SOFCs. Shiono, Mitsunobu; Kobayashi, Kenichi; Lan Nguyen, Tuong; Hosoda, Kan; Kato, Toru; Ota, Kenichiro; Dokiya, Masayuki (Graduate School of Environment and Information Sciences, Yokohama National University, Yokohama, Hodogaya, 240-8501, Japan). Solid State Ionics, 170(1-2), 1-7 (English) 2004. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..
- AB Porous Ce_{0.9}Gd_{0.1}O_{2-δ} (GDC) and dense Ce_{0.8}Sm_{0.2}O_{2-δ} (SDC) protection interlayer were introduced between Scandia-stabilized zirconia (SSZ) electrolyte and La_{0.6}Sr_{0.4}CoO_{3-δ} (LSC) cathode of low-temperature SOFCs which operate at 600-800 °C. The reactivity of the interlayer and the area-specific resistance (ASR) were investigated. EPMA anal. clearly showed that the reaction between LSC cathode and SSZ electrolyte did not occur even though GDC interlayer (3-6 μm) was porous. Moreover, the reaction between GDC interlayer and SSZ electrolyte which were fired at 1320 °C was not observed. The ASR of LSC/GDC/SSZ measured by an AC impedance method was reduced 40% or more at each temperature compared to LSC cathode on a GDC pellet and showed a low value in 600-800 °C. Thin and relatively dense SDC interlayer (<1 μm) was fabricated between LSC cathode and SSZ electrolyte by using 2-ethylhexanoic acid salts of Sm and Ce, and also in the system using this SDC thin interlayer, low ASR equivalent to LSC/GDC/SSZ was shown, and it became clear that the interlayer in this experiment is very effective in the reduction of ASR.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 49
- ST ceria interlayer zirconia electrolyte LSC cathode low temp SOFC
- IT Electric impedance
 Electric resistance
 Fuel cell cathodes
 Fuel cell electrolytes
 (CeO₂ interlayer effect on ZrO₂ electrolyte/La(Sr)CoO₃ cathode for low-temperature SOFCs)
- IT Fuel cells
 (solid oxide; CeO₂ interlayer effect on ZrO₂ electrolyte /La(Sr)CoO₃ cathode for low-temperature SOFCs)
- IT 10026-22-9, Nitric acid, cobalt(2+) salt, hexahydrate
 10042-76-9, Nitric acid, strontium salt 10277-43-7, Nitric acid, lanthanum(3+) salt, hexahydrate
 RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (CeO₂ interlayer effect on ZrO₂ electrolyte/La(Sr)CoO₃ cathode for low-temperature SOFCs)
- IT 110620-52-5D, Cobalt lanthanum strontium oxide (CoLa_{0.6}Sr_{0.4}O₃), oxygen-depleted 162105-72-8D, Cerium samarium oxide (Ce_{0.8}Sm_{0.2}O₂), oxygen-depleted 183546-68-1D, Cerium gadolinium oxide (Ce_{0.9}Gd_{0.1}O₂), oxygen-depleted 309934-52-9, Cerium scandium zirconium oxide (Ce_{0.01}Sc_{0.2}Zr_{0.89}O_{2.1})
 RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)
 (CeO₂ interlayer effect on ZrO₂ electrolyte/La(Sr)CoO₃ cathode for low-temperature SOFCs)

L379 ANSWER 28 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:431502 Document No. 141:126244 Proton Conductive Polyimide Electrolytes Containing Fluorenyl Groups: Synthesis, Properties, and Branching Effect. Miyatake, Kenji; Zhou, Hua; Watanabe, Masahiro (Clean Energy Research Center,

- University of Yamanashi, Kofu, 400-8510, Japan). *Macromolecules*, 37(13), 4956-4960 (English) 2004. CODEN: MAMOBX. ISSN: 0024-9297. Publisher: American Chemical Society.
- AB Novel sulfonated polyimide copolymers as **electrolytes** for high-**temperature fuel cell** applications are reported. Sulfonated polyimide copolymers (SPIH-X; X refers to molar **percentage** of fluorenyl content) containing 0-60 mol % of fluorenyl groups as hydrophobic component were synthesized, of which **electrolyte** properties were studied and compared to those of the perfluorinated **ionomer** (Nafion 112). High-mol.-**weight** copolymers with good film-forming capability were obtained. Thermal stability with decomposition **temperature** of ca. 280 °C and no glass transition **temperature** was confirmed for the copolymers. SPIH shows unique water uptake behavior with the maximum value of 57% at X = 30. Water mols. absorbed in the **electrolyte** membrane with this specific composition do not evaporate easily so that the high **proton conductivity** of 1.67 S cm⁻¹ was obtained at 120° and 100% RH. The branching and crosslinking of SPIH-30 were carried out by applying 2 mol % of trifunctional monomer (melamine) in the polymerization and by electron beam irradiation upon the membrane. The branching and crosslinking are effective to improve oxidative stability and mech. strength. Although the **proton conductivity** decreases slightly by the branching and crosslinking, it still remains at the comparable level to that of Nafion 112.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 35, 38, 72, 76
- ST **proton conductive polyimide electrolyte** fluorenyl group branching sulfonated membrane; **fuel cell separator membrane polyelectrolyte** arom polyimide mech strength
- IT Polyimides, uses
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(fluorene group- and fluorine-containing, cardo, aryl, sulfonate-containing; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT Polyoxyalkylenes, uses
RL: DEV (Device component use); USES (Uses)
(fluorine- and sulfo-containing, ionomers, electrode binder; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT Current density
(from methanol crossover, voltage and humidity effect on; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT Electric current-potential relationship
(of assembled **fuel cell**; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT Stability
(oxidative; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT Carbon fibers, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(paper, anode **support**; synthesis, properties, and DMFC performance of **proton conductive polyimide electrolytes** containing trifluoromethyl groups)
- IT Fluoropolymers, uses
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic

- preparation); PREP (Preparation); USES (Uses)
(polyimide-, fluorene group-containing, cardo, aryl, sulfonate-containing; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT Cardo polymers
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(polyimides, fluorene group- and fluorine-containing, aryl, sulfonate-containing; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, ionomers, electrode binder; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT Ionomers
RL: DEV (Device component use); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing, electrode binder; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT Ion exchange membranes
(preparation and ion exchange capacity of; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT Ionic conductivity
(**proton**; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT Crosslinking
(radiochem.; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT Fuel cell separators
Fuel cells
Membrane electrodes
Membranes, nonbiological
Polyelectrolytes
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT Carbon black, uses
RL: DEV (Device component use); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT Fluoropolymers, uses
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 117-61-3P, 4,4'-Diamino-2,2'-biphenyldisulfonic acid
RL: PUR (Purification or recovery); RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(DAPS; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 15499-84-0, 4,4'-(9-Fluorenylidene)dianiline
RL: RCT (Reactant); RACT (Reactant or reagent)
(FDA; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

- IT 7732-18-5, Water, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)
(absorption of; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 7720-78-7, Ferrous sulfate
RL: CAT (Catalyst use); USES (Uses)
(for oxidative stability; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 500783-35-7P
RL: PRP (Properties); PUR (Purification or recovery); SPN (Synthetic preparation); PREP (Preparation)
(plain and crosslinked; synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 42615-02-1
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 67-56-1, Methanol, uses
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 7440-06-4, Platinum, uses 7440-57-5, Gold, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 108-39-4, m-Cresol, uses
RL: NUU (Other use, unclassified); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 481001-37-0P 724457-95-8P
RL: PRP (Properties); PUR (Purification or recovery); SPN (Synthetic preparation); PREP (Preparation)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 163294-14-2, Nafion 112
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)
- IT 65-85-0, Benzoic acid, reactions 81-30-1, 1,4,5,8-Naphthalenetetracarboxylic dianhydride 108-78-1, Melamine, reactions 121-44-8, Triethylamine, reactions 7722-84-1, Hydrogen peroxide, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(synthesis, properties, and DMFC performance of **proton conductive** polyimide electrolytes containing trifluoromethyl groups)

L379 ANSWER 29 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:287992 Document No. 140:306758 Electrode-supported
fuel cell. Rietveld, Gijsbertus; Van Druten,
Gerry Martina Regina (Stichting Energieonderzoek Centrum Nederland,
Neth.). PCT Int. Appl. WO 2004030133 A1 20040408, 11 pp.

DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English).
 CODEN: PIXXD2. APPLICATION: WO 2003-NL663 20030929. PRIORITY: NL 2002-1021547 20020927.

AB Cathode-supported fuel cell wherein the cathode support comprises a porous part made of an alloy containing iron and chromium and more particularly stainless steel. The anode has a thickness of 1-50 .mu.m and preferably consists of nickel/nickel oxide. The cathode preferably consists of LSM material. Such an electrode-supported fuel cell can be produced by providing a metallic support containing at least iron or chromium by means of sintering, preferably starting from a powder, successively applying thereto an electrode, electrolyte and other electrodes. With this method, a cathode is applied to the metallic support and the combination obtained is sintered at a temperature between 1000 and 1200°.

IT 7440-47-3, Chromium, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (cathode support; electrode-supported fuel cell)

RN 7440-47-3 HCAPLUS
 CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

IT 7440-02-0, Nickel, uses
 RL: DEV (Device component use); USES (Uses)
 (electrode-supported fuel cell)

RN 7440-02-0 HCAPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M008-02
 ICS H01M008-24

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 55

ST electrode supported fuel cell

IT Alloys, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (cathode support; electrode-supported fuel cell)

IT Fuel cell anodes
 Fuel cell cathodes
 Fuel cells
 Printing (impact)
 Sintering
 (electrode-supported fuel cell)

IT Powders
 (sintered, cathode support; electrode-supported fuel cell)

IT Coating process
 (spin; electrode-supported fuel cell)
)

IT 7439-89-6, Iron, uses 7440-47-3,
Chromium, uses 11122-73-9 12597-68-1, Stainless steel,
uses
RL: TEM (Technical or engineered material use); USES (Uses)
(cathode support; electrode-supported
fuel cell)

IT 1313-99-1, Nickel oxide, uses 7440-02-0,
Nickel, uses 59707-46-9, Lanthanum manganese
strontium oxide
RL: DEV (Device component use); USES (Uses)
(electrode-supported fuel cell)

IT 11133-82-7
RL: TEM (Technical or engineered material use); USES (Uses)
(electrode-supported fuel cell)

L379 ANSWER 30 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:275234 Document No. 141:74133 The influence of noble-
metal-containing cathodes on the electrochemical performance
of anode-supported SOFCs. Haanappel, V. A. C.; Rutenbeck,
D.; Mai, A.; Uhlenbruck, S.; Sebold, D.; Wesemeyer, H.; Rowekamp,
B.; Tropartz, C.; Tietz, F. (Institute for Materials and Processes
in Energy Systems, Forschungszentrum Julich, Julich, 52425,
Germany). Journal of Power Sources, 130(1-2), 119-128 (English)
2004. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science
B.V..

AB To enhance the catalytic activity of the cathode for oxygen reduction
and thus to increase the electrochem. performance of planar anode-
supported solid oxide fuel cells, Pd,
Ag, or Pt was added to the cathode. Four routes were used to add
these noble metals: infiltration of the cathode with a Pd
solution, deposition of Pt on the electrolyte surface
, mixing of La_{0.65}Sr_{0.30}MnO₃ (LSM) and YSZ cathode powders with
different metal precursors (Pt and Pd black, Pd on
activated carbon, Ag powder, Ag₂O, Ag acetate, Ag citrate, Ag₂CO₃,
colloidal Ag, AgNO₃), and synthesis of LSM powder with the addition of
AgNO₃. Between 750 and 900° no electrocatalytic effect
occurred with respect to the presence of Pt, either added by
deposition on the electrolyte or by mixing with cathode
powders. Infiltration of the cathode with a Pd solution or mixing with
Pd black did not result in a pos. effect either. A catalytic effect
was only found with Pd on activated carbon and in particular at
lower temps. Cells prepared with Ag powder and Ag₂O showed
an improved electrochem. performance compared to Ag-free cells
sintered at the same temperature (920°). However, in
comparison to Ag-free cells sintered at the standard temperature
(1100°) lower current densities were measured. This can be
explained by a weak contact between electrolyte and
cathode functional layer and an insufficiently sintered
cathode. A detrimental effect was observed regarding the addition of the
other Ag precursors. Thermal decomposition of these precursors gave
large pores in the cathode.

IT 7440-05-3, Palladium, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(influence of noble-metal-containing cathodes on
electrochem. performance of anode-supported SOFCs)

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 57, 72, 76

ST noble metal cathode anode supported solid oxide
fuel cell; YSZ LSM cathode metal precursor deposition

- current density potential
- IT Electric resistance
(area-specific; comparison of current-voltage relationships for fuel cells with different cathode metal catalysts, silver precursors and content level, bias voltages, and temps.)
- IT Noble metals
RL: CAT (Catalyst use); DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(comparison of current-voltage relationships for fuel cells with different cathode metal catalysts, silver precursors and content level, bias voltages, and temps.)
- IT Coprecipitation
Fuel cell cathodes
Impregnation
Vapor deposition process
(influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT Current density
Electric current-potential relationship
(of assembled fuel cells; comparison of current-voltage relationships for fuel cells with different cathode metal catalysts, silver precursors and content level, bias voltages, and temps.)
- IT Fuel cells
(solid oxide; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 157975-55-8P, Lanthanum manganese strontium oxide ($\text{La}_{0.65}\text{MnSr}_{0.303}$)
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(LSM, cathode, and layer with 8YSZ; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-44-0, Carbon, uses
RL: DEV (Device component use); USES (Uses)
(activated, with Pd, in cathode composite fabrication; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-02-0P, Nickel, uses
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(anode cermet with 8YSZ and mesh; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 403694-09-7, 8YSZ
RL: DEV (Device component use); USES (Uses)
(anode cermet with Ni, and electrolyte layer, cathode functional layer with LSM; influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-05-3, Palladium, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-22-4P, Silver, uses
RL: CAT (Catalyst use); DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 1333-74-0, Hydrogen, uses
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); TEM (Technical or engineered material use); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(influence of noble-metal-containing cathodes on electrochem. performance of anode-supported SOFCs)
- IT 7440-06-4, Platinum, uses

RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(powder and mesh on cathode **side**; influence of noble-
metal-containing cathodes on electrochem. performance of
anode-supported SOFCs)

IT 534-16-7 563-63-3, Silver acetate 7761-88-8, Silver nitrate,
reactions 20667-12-3, Silver oxide (Ag₂O) 36701-38-9, Silver
citrate
RL: PEP (Physical, engineering or chemical process); PYP (Physical
process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(precursor; influence of noble-**metal**-containing cathodes on
electrochem. performance of anode-supported SOFCs)

L379 ANSWER 31 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:204125 Document No. 140:202496 Fuel cell electrode. Scott,
Keith; Cheng, Hua (Newcastle University Ventures Limited, UK). PCT
Int. Appl. WO 2004021486 A2 20040311, 61 pp. DESIGNATED STATES: W:
AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO,
CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR,
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU,
LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT,
RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG,
US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI,
CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE,
NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2.
APPLICATION: WO 2003-GB3715 20030827. PRIORITY: GB 2002-19955
20020828.

AB The invention concerns a **fuel cell** having an
electrode comprising an electrocatalyst on a **support**,
wherein the **support** is a mesh of conductive material, as
well as a method of operating such a **fuel cell**
by contacting a fuel and an oxidant on the electrode. The
electrolyte is an ion exchange membrane. The
electrocatalyst is a **metal**, **metal alloy**,
metal oxide, or **metal hydride**.

IT 7440-32-6, **Titanium**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**support**; fuel cell electrode)

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

IC ICM H01M008-00
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT Polyoxyalkylenes, uses
RL: DEV (Device component use); USES (Uses)
(fluorine- and sulfo-containing, **ionomers**; **fuel**
cell electrode)

IT Fuel cell anodes
Fuel cell cathodes
Ion exchange membranes
(**fuel cell** electrode)

IT Alloys, uses
Hydrides
Metals, uses
Oxides (inorganic), uses
RL: CAT (Catalyst use); USES (Uses)
(**fuel cell** electrode)

IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(polyoxyalkylene-, sulfo-containing, **ionomers**; **fuel**
cell electrode)

IT **Ionomers**
RL: DEV (Device component use); USES (Uses)

(polyoxyalkylenes, fluorine- and sulfo-containing; fuel cell electrode)

IT **Fuel cells**
(solid electrolyte; fuel cell electrode)

IT **Titanium alloy, base**
RL: TEM (Technical or engineered material use); USES (Uses)
(support; fuel cell electrode)

IT **7440-32-6, Titanium, uses**
RL: TEM (Technical or engineered material use); USES (Uses)
(support; fuel cell electrode)

L379 ANSWER 32 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2004:41397 Document No. 140:61782 **Metal oxides prepared by flame spray pyrolysis.** Stark, Wendelin J.; Maedler, Lutz; Pratsinis, Sotiris E. (Eidgenoessische Technische Hochschule Zuerich, Switz.). PCT Int. Appl. WO 2004005184 A1 20040115, 45 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2003-IB2172 20030520. PRIORITY: EP 2002-14100 20020703; US 2002-2002/PV394965 20020709.

AB **Metal oxides, especially zirconia stabilized with ceria or yttria, are prepared by flame spray pyrolysis.** The **metal** oxide precursors are dissolved in a mixture of carboxylic acids, preferably acetic acid and lauric acid at a ratio of 1:1, and the mixture is subjected to a flame having a **temperature** of 1600-2600°C. The solvent has an enthalpy of at least 15 kJ/g, preferably at at least about 23.7 kJ/g. The **metal** oxide precursors are organic **salts**, especially cerium acetate hydrate and zirconium acetylacetonate. The produced mixed oxide is phase stable upon heating at 900° for 2 h in air. The mixed oxide has a dynamic oxygen storage capacity after heat treatment at 700° for 16 h in air of at least 1.5 L O₂/kg catalyst and is therefor suitable as a three-way catalyst material for internal combustion engines. The ceria/zirconia mixed oxide can be mixed with a monolithic structure giving material, such as Al₂O₃. The catalyst can contain addnl. catalytically active substances, such as further **metal** oxides, e.g. titania, vanadia, chromia, manganese, iron, cobalt, nickel, copper oxides, and/or noble **metals**, e.g. platinum, palladium, rhodium, ruthenium, rhenium, and iridium. The mixed oxide can be used for mechanochem. polishing, as heterogeneous catalysts, as structural ceramics, as battery storage materials, for chemical sensors, for elements in energy production, for solar energy production elements, for electron storage in recyclable battery units, as dielects., as ferroelec., as gas permeable membranes, as pigments, polymer additives, stabilizers, magnetic fluids, polishing powders, additives in **metal** alloys, in armor fabrication, in microelectronics, as electrode raw material, as phosphors for radiation sensitive elements and in displays, cosmetics, pharmaceutical packaging, additive in food and pharmaceutical applications, **fuel cells**, and/or superconductors.

IT **7440-05-3, Palladium, uses**
RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
(**metal** oxides prepared by flame spray pyrolysis)

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C01B013-34
ICS C01F017-00; C01G025-02; C01G025-00; B01J023-00; B01J023-10;
B01J035-10; B01J023-63; C09K003-14; B01J023-42
CC 49-3 (Industrial Inorganic Chemicals)
Section cross-reference(s): 57, 59, 67
IT Polishing
(chemical-mech.; **metal** oxides prepared by flame spray
pyrolysis)
IT Exhaust gas catalytic converters
(**metal** oxides prepared by flame spray pyrolysis)
IT Calcination
(spray; **metal** oxides prepared by flame spray pyrolysis)
IT Catalysts
(three-way; **metal** oxides prepared by flame spray
pyrolysis)
IT 1344-28-1, Aluminum oxide (Al₂O₃), uses
RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
(catalyst support; **metal** oxides prepared by
flame spray pyrolysis)
IT 1308-38-9, Chromium oxide (Cr₂O₃), uses 1313-99-1,
Nickel oxide (NiO), uses 1314-62-1, Vanadium
oxide (V₂O₅), uses 1332-37-2, Iron oxide, uses
1344-70-3, Copper oxide 7439-88-5, Iridium, uses
7439-96-5, Manganese, uses 7440-05-3, Palladium,
uses 7440-06-4, Platinum, uses 7440-15-5, Rhenium, uses
7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 11104-61-3,
Cobalt oxide 13463-67-7, Titanium oxide (TiO₂), uses
RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
(**metal** oxides prepared by flame spray pyrolysis)
IT 17501-44-9 133648-99-4
RL: RCT (Reactant); RACT (Reactant or reagent)
(**metal** oxides prepared by flame spray pyrolysis)
IT 64-19-7, Acetic acid, uses 143-07-7, Dodecanoic acid, uses
RL: NUU (Other use, unclassified); USES (Uses)
(solvent; **metal** oxides prepared by flame spray pyrolysis)
IT 7782-44-7, Oxygen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(storage; **metal** oxides prepared by flame spray pyrolysis)
IT 1314-23-4, Zirconium oxide (ZrO₂), uses
RL: CAT (Catalyst use); NUU (Other use, unclassified); USES (Uses)
(yttria or ceria-stabilized; **metal** oxides prepared by
flame spray pyrolysis)
IT 1306-38-3, Cerium oxide (CeO₂), uses 1314-36-9, Yttrium oxide
(Y₂O₃), uses
RL: CAT (Catalyst use); MOA (Modifier or additive use); USES (Uses)
(zirconia stabilized with; **metal** oxides prepared by flame
spray pyrolysis)

L379 ANSWER 33 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:39663 Document No. 140:62378 Molten **hydride** fuel cell.Roy, Prodyot; Salamah, Samir Armando; Rodgers, Douglas Noss (General
Electric Company-Global Research Center, USA). U.S. Pat. Appl.

Publ. US 2004009390 A1 20040115, 8 pp. (English). CODEN: USXXCO.

APPLICATION: US 2002-64408 20020710.

AB A **fuel cell** assembly comprises at least one**fuel cell**. The **fuel cell**comprises an anode and a cathode held in a spaced apart relationship
by at least one spacer element comprising an elec. insulating
material. A proximal end of the spacer element is in contact with
the cathode, and a distal end is in contact with the anode. An
electrolyte is disposed between, and in contact with the
anode and the cathode. The **electrolyte** comprises a molten

salt having a **hydride ion** conductance number greater than about 0.95 at a **fuel cell** operating **temperature**. A fuel gas inlet, adjacent to the cathode, is provided for delivering a fuel gas to the **electrolyte**. An oxidizing gas inlet, adjacent to the anode, is provided for delivering an oxidizing gas to the **electrolyte**. An exhaust port is in fluid communication with the anode.

IT 7440-05-3, **Palladium**, uses 7440-62-2, **Vanadium**, uses 12735-99-8
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membrane; molten **hydride** fuel cell)
 RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-62-2 HCAPLUS
 CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

RN 12735-99-8 HCAPLUS
 CN Silver alloy, nonbase, Ag, Pd (9CI) (CA INDEX NAME)

Component	Component Registry Number
=====+=====	
Ag	7440-22-4
Pd	7440-05-3

IT 7440-32-6, **Titanium**, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (β -, membrane; molten **hydride** fuel cell)
 RN 7440-32-6 HCAPLUS
 CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

IC ICM H01M008-14
 ICS H01M004-94
 INCL 429046000; 429040000
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST fuel cell molten **hydride**
 IT Membranes, nonbiological
 (hydrogen-permeable; molten **hydride** fuel cell)
 IT Fuel cell anodes
 Fuel cell cathodes
 Fuel cells
 Refractories
 (molten **hydride** fuel cell)
 IT **Hydrides**
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (molten **hydride** fuel cell)
 IT Alkali metal halides, uses
 Alkali metal **hydrides**
Salts, uses
 RL: DEV (Device component use); USES (Uses)
 (molten; molten **hydride** fuel cell)

IT Silicate glasses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (spacer; molten **hydride** fuel cell)

IT 7440-05-3, Palladium, uses 7440-62-2,
 Vanadium, uses 12735-99-8
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membrane; molten **hydride** fuel cell)

IT 7782-44-7, Oxygen, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); PROC (Process)
 (molten **hydride** fuel cell)

IT 74-82-8, Methane, uses 74-98-6, Propane, uses 1333-74-0,
 Hydrogen, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (molten **hydride** fuel cell)

IT 7447-40-7, Potassium chloride (KCl), uses 7447-41-8, Lithium
 chloride (LiCl), uses 7550-35-8, Lithium bromide (LiBr)
 7580-67-8, Lithium **hydride** (LiH) 7646-69-7, Sodium
hydride (NaH) 7647-14-5, Sodium chloride, uses
 7647-15-6, Sodium bromide (NaBr), uses 7681-49-4, Sodium fluoride,
 uses 7693-26-7, Potassium **hydride** 7758-02-3, Potassium
 bromide (KBr), uses 7789-23-3, Potassium fluoride (KF)
 7789-24-4, Lithium fluoride, uses
 RL: DEV (Device component use); USES (Uses)
 (molten; molten **hydride** fuel cell)

IT 7439-98-7, Molybdenum, uses 7440-15-5, Rhenium, uses 7440-33-7,
 Tungsten, uses
 RL: DEV (Device component use); USES (Uses)
 (refractory; molten **hydride** fuel cell)

IT 1314-23-4, Zirconia, uses 1344-28-1, Alumina, uses 10043-11-5,
 Boron nitride, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (spacer; molten **hydride** fuel cell)

IT 7440-32-6, Titanium, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (β -, membrane; molten **hydride** fuel cell)

L379 ANSWER 34 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2004:17779 Document No. 140:62322 **Ionic conductors**
 containing amorphous silica gel for **fuel cell**
electrolytes and secondary lithium battery
electrolytes. Mori, Hiroshi; Tezuka, Makoto (Mitsubishi
 Chemical Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2004002114 A2
 20040108, 20 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
 2002-160636 20020531.

AB The silica gel has pore volume 0.3-3.0 mL/g, sp. **surface**
 area 200-1000 m²/g, a pore size distribution having a peak at 20 nm,
 and solid Si-NMR spectrum having prescribed chemical shift (δ
 ppm) of Q4 peak (definition given). The **ionic conductors**
 contain ionic conductive compds. or compns. (either **proton**
conductive or Li ion conductive) in addition to the silica gel
supports. Thus, tetramethoxysilane was hydrolyzed, gelated,
 and hydrothermally treated to give the silica gel which was then
 soaked in an aqueous H₃PO₄ solution to carry H₃PO₄ (**proton**
conductor). The obtained **proton conductor**
 showed excellent performance at a wide **temperature** region.

IC ICM C01B033-152

ICS H01B001-06; H01M008-02; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 76

ST **ionic conductor support** amorphous
 silica gel; **proton conductor support**
 amorphous silica gel; **fuel cell**
electrolyte amorphous silica gel; lithium battery
electrolyte amorphous silica gel

IT Silica gel, uses

- RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (amorphous; **ionic conductors** containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery electrolytes)
- IT **Fuel cell electrolytes**
Ionic conductors
Solid electrolytes
 (ionic conductors containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery electrolytes)
- IT **Battery electrolytes**
 (lithium; **ionic conductors** containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery electrolytes)
- IT 681-84-5, Tetramethoxysilane
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
 (hydrolysis, gelation, and hydrothermal treatment of; **ionic conductors** containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery electrolytes)
- IT 7664-38-2, Phosphoric acid, uses
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (**proton conductor; ionic conductors** containing amorphous silica gel **supports** useful for **fuel cell electrolytes** and secondary Li battery electrolytes)
- L379 ANSWER 35 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2004:17411 Document No. 140:44264 **Metal** oxides prepared by flame spray pyrolysis. Stark, Wendelin J.; Maedler, Lutz; Pratsinis, Sotiris E. (Eidgenoessische Technische Hochschule Zuerich, Switz.). Eur. Pat. Appl. EP 1378489 A1 20040107, 24 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, SK. (English). CODEN: EPXXDW. APPLICATION: EP 2002-14100 20020703.
- AB **Metal** oxides, especially zirconia stabilized with ceria or yttria, are prepared by flame spray pyrolysis. The **metal** oxide precursors are dissolved in a mixture of carboxylic acids, preferably acetic acid and lauric acid at a ratio of 1:1, and the mixture is subjected to a flame having a **temperature** of 1600-2600°C. The solvent has an enthalpy of at least 15 kJ/g, preferably at at least about 23.7 kJ/g. The **metal** oxide precursors are organic **salts**, especially cerium acetate hydrate and zirconium acetylacetonate. The produced mixed oxide is phase stable upon heating at 900° for 2 h in air. The mixed oxide has a dynamic oxygen storage capacity after heat treatment at 700° for 16 h in air of at least 1.5 L O₂/kg catalyst and is therefor suitable as a three-way catalyst material for internal combustion engines. The ceria/zirconia mixed oxide can be mixed with a monolithic structure giving material, such as Al₂O₃. The catalyst can contain addnl. catalytically active substances, such as further **metal** oxides, e.g. titania, vanadia, chromia, manganese, iron, cobalt, **nickel**, **copper** oxides, and/or noble **metals**, e.g. platinum, **palladium**, rhodium, ruthenium, rhenium, and iridium. The mixed oxide can be used for mechanochem. polishing, as heterogeneous catalysts, as structural ceramics, as battery storage materials, for

chemical sensors, for elements in energy production, for solar energy production elements, for electron storage in recyclable battery units, as dielects., as ferroelec., as gas permeable membranes, as pigments, polymer additives, stabilizers, magnetic fluids, polishing powders, additives in metal alloys, in armor fabrication, in microelectronics, as electrode raw material, as phosphors for radiation sensitive elements and in displays, cosmetics, pharmaceutical packaging, additive in food and pharmaceutical applications, fuel cells, and/or superconductors.

IT 7440-05-3, Palladium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (metal oxides prepared by flame spray pyrolysis)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C01B013-34
 ICS C01F017-00; C01G025-02; C01G025-00; B01J023-00; B01J023-10; B01J035-10; B01J023-63; C09K003-14

CC 49-3 (Industrial Inorganic Chemicals)
 Section cross-reference(s): 57, 59, 67

IT Polishing
 (chemical-mech.; metal oxides prepared by flame spray pyrolysis)

IT Exhaust gas catalytic converters
 (metal oxides prepared by flame spray pyrolysis)

IT Calcination
 (spray, flame; metal oxides prepared by flame spray pyrolysis)

IT Catalysts
 (three-way; metal oxides prepared by flame spray pyrolysis)

IT 1344-28-1, Alumina, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst support; metal oxides prepared by flame spray pyrolysis)

IT 1308-38-9, Chromia, uses 1313-99-1, Nickel oxide, uses
 1314-62-1, Vanadia, uses 1332-37-2, Iron oxide, uses
 1344-70-3, Copper oxide 7439-88-5, Iridium, uses
 7439-96-5, Manganese, uses 7440-05-3, Palladium,
 uses 7440-06-4, Platinum, uses 7440-15-5, Rhenium, uses
 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 11104-61-3,
 Cobalt oxide 13463-67-7, Titania, uses
 RL: CAT (Catalyst use); USES (Uses)
 (metal oxides prepared by flame spray pyrolysis)

IT 17501-44-9, Zirconium acetylacetonate 133648-99-4, Acetic acid,
 cerium(3+) salt, monohydrate
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (metal oxides prepared by flame spray pyrolysis)

IT 64-19-7, Acetic acid, uses 143-07-7, Lauric acid, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (solvent; metal oxides prepared by flame spray pyrolysis)

IT 7782-44-7, Oxygen, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (storage; metal oxides prepared by flame spray pyrolysis)

IT 1314-23-4P, Zirconia, preparation
 RL: CAT (Catalyst use); NUU (Other use, unclassified); SPN
 (Synthetic preparation); PREP (Preparation); USES (Uses)
 (yttria or ceria-stabilized; metal oxides prepared by flame spray pyrolysis)

IT 1306-38-3P, Ceria, preparation 1314-36-9P, Yttria, preparation
 RL: CAT (Catalyst use); MOA (Modifier or additive use); NUU (Other

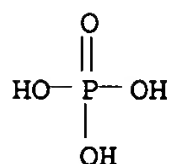
use, unclassified); SPN (Synthetic preparation); PREP (Preparation);
 USES (Uses)
 (zirconia stabilized with; metal oxides prepared by flame
 spray pyrolysis)

L379 ANSWER 36 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:1012123 Document No. 140:96838 High-Performance Solid Acid Fuel
 Cells Through Humidity Stabilization. Boysen, Dane A.; Uda,
 Tetsuya; Chisholm, Calum R. I.; Haile, Sossina M. (Materials
 Science, California Institute of Technology, Pasadena, CA, 91125,
 USA). Science (Washington, DC, United States), 303(5654), 68-70
 (English) 2004. CODEN: SCIEAS. ISSN: 0036-8075. Publisher:
 American Association for the Advancement of Science.

AB State-of-the-art fuel cells based on polymer
 electrolyte membranes are inoperable >100°, they
 require cumbersome humidification systems, and suffer from fuel
 permeation. These difficulties all arise from the hydrated nature
 of the electrolyte. Solid acids however exhibit anhydrous p
 transport and high-temperature stability. Continuous, stable
 power generation for both H₂/O₂ and direct MeOH fuel
 cells operated at .apprx.250° was demonstrated using
 a humidity-stabilized solid acid CsH₂PO₄
 electrolyte.

IT 18649-05-3, Cesium phosphate (CsH₂PO₄)
 RL: DEV (Device component use); USES (Uses)
 (electrolyte; in humidity stabilization of
 high-performance fuel cell with solid acid
 electrolyte)

RN 18649-05-3 HCAPLUS
 CN Phosphoric acid, monocation salt (8CI, 9CI) (CA INDEX NAME)



● Cs

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST cesium phosphate solid acid electrolyte humidity
 stabilization fuel cell

IT Fuel cell electrolytes
 Fuel cell separators
 Humidity
 (humidity stabilization of high-performance fuel
 cell with solid acid electrolyte)

IT 18649-05-3, Cesium phosphate (CsH₂PO₄)
 RL: DEV (Device component use); USES (Uses)
 (electrolyte; in humidity stabilization of
 high-performance fuel cell with solid acid
 electrolyte)

IT 1333-74-0, Hydrogen, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (humidity stabilization of solid acid electrolyte for
 high-performance fuel cell using)

IT 67-56-1, Methanol, uses 7782-44-7, Oxygen, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (humidity stabilization of solid acid electrolyte for
 high-performance fuel cell using)

L379 ANSWER 37 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:989964 Document No. 140:29512 Solid oxide fuel cell with enhanced mechanical and electrical properties. Carter, John David; Bae, Joong-Myeon; Cruse, Terry Alan; Ralph, James Michael; Kumar, Romesh; Krumpelt, Michael (USA). U.S. Pat. Appl. Publ. US 2003232230 A1 20031218, 10 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-167917 20020612.

AB A solid oxide fuel cell (SOFC) repeat unit includes an oxide electrolyte, an anode, a metallic fuel flow field, a metallic interconnect, and a metallic air flow field. The multilayer laminate is made by casting tapes of the different functional layers, laminating the tapes together and sintering the laminate in a reducing atmospheric SOFC stacks are made by applying a cathode layer, bonding the unit into a gas manifold plate, and then stacking the cells together. This process leads to superior mech. properties in the SOFC due to the toughness of the supporting metallic layers. It also reduces contact resistances in stacking the cells since there is only one phys. contact plane for each repeat unit.

IT 7440-02-0, Nickel, uses
 RL: DEV (Device component use); USES (Uses)
 (solid oxide fuel cell with enhanced mech. and elec. properties)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M008-12
 ICS H01M008-24

INCL 429032000; 429038000; 264618000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST fuel cell solid oxide

IT Fuel cell anodes
 (ceramic-metal; solid oxide fuel cell with enhanced mech. and elec. properties)

IT Catalysts
 (electrocatalysts; solid oxide fuel cell with enhanced mech. and elec. properties)

IT Fuel cell electrolytes
 Interconnections, electric
 (solid oxide fuel cell with enhanced mech. and elec. properties)

IT Fuel cells
 (solid oxide; solid oxide fuel cell with enhanced mech. and elec. properties)

IT Molding
 (tape-casting; solid oxide fuel cell with enhanced mech. and elec. properties)

IT Nickel alloy, base
 RL: DEV (Device component use); USES (Uses)
 (solid oxide fuel cell with enhanced mech. and elec. properties)

IT 1314-36-9, Yttria, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (ZrO2 stabilized with; solid oxide fuel cell with enhanced mech. and elec. properties)

IT 11129-18-3, Cerium oxide 55030-80-3, Gallium lanthanum oxide
 RL: DEV (Device component use); USES (Uses)
 (doped; solid oxide fuel cell with enhanced mech. and elec. properties)

IT 7440-02-0, Nickel, uses 64417-98-7, Yttrium zirconium oxide

RL: DEV (Device component use); USES (Uses)
(solid oxide fuel cell with enhanced mech.
and elec. properties)

IT 1314-23-4, Zirconia, uses
RL: DEV (Device component use); USES (Uses)
(yttria-stabilized; solid oxide fuel cell
with enhanced mech. and elec. properties)

L379 ANSWER 38 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:969455 Document No. 140:29505 Thin-film barium-transition
metal oxide-rare earth oxide proton-
conducting solid electrolytes for fuel
cells. Taniguchi, Noboru (Matsushita Electric Industrial
Co., Ltd., Japan). Eur. Pat. Appl. EP 1369949 A2 20031210, 28 pp.
DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI,
LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ,
EE, HU, SK. (English). CODEN: EPXXDW. APPLICATION: EP 2003-12535
20030602. PRIORITY: JP 2002-165456 20020606.

AB A thin-film (≤ 300 μm thickness) proton-
conducting solid electrolyte for a solid-oxide
fuel cell has the general composition
 $\text{Ba}(\text{Zr}_{1-x}\text{Ce}_x)\text{M}_y\text{Al}_z\text{O}_{3-\alpha}$, in which M is one or more trivalent
rare earth cations and In^{3+} ; $y = 0-0.3$; $x = 0-1$; $z =$
 $0-0.4$; and $\alpha = 0-1.5$. The fuel cell
electrode is typically carbon-supported Pt. A solid-
electrolyte fuel cell can obtain a cell
output even at low temperature (i.e., $\leq 500^\circ$).

IT 288866-05-7P, Barium cerium neodymium zirconium oxide
($\text{BaCe}_{0.4}\text{Nd}_{0.2}\text{Zr}_{0.4}\text{O}_3$) 386720-65-6P, Barium cerium
gadolinium zirconium oxide ($\text{BaCe}_{0.2}\text{Gd}_{0.2}\text{Zr}_{0.6}\text{O}_3$)
632286-96-5P, Barium cerium gadolinium zirconium oxide
($\text{BaCe}_{0.24}\text{Gd}_{0.24}\text{Zr}_{0.52}\text{O}_3$) 632286-97-6P, Barium cerium
gadolinium zirconium oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.2}\text{Zr}_{0.56}\text{O}_3$)
632287-08-2P, Barium cerium gadolinium zirconium oxide
($\text{BaCe}_{0.2}\text{Gd}_{0.4}\text{Zr}_{0.4}\text{O}_3$)
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
preparation); TEM (Technical or engineered material use); PREP
(Preparation); USES (Uses)
(oxygen-deficient, proton conductors;
thin-film barium-transition metal oxide-rare earth
oxide proton-conducting solid
electrolytes for fuel cells)

RN 288866-05-7 HCAPLUS
CN Barium cerium neodymium zirconium oxide ($\text{BaCe}_{0.4}\text{Nd}_{0.2}\text{Zr}_{0.4}\text{O}_3$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.4	7440-67-7
Ce	0.4	7440-45-1
Ba	1	7440-39-3
Nd	0.2	7440-00-8

RN 386720-65-6 HCAPLUS
CN Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.2}\text{Gd}_{0.2}\text{Zr}_{0.6}\text{O}_3$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.6	7440-67-7
Gd	0.2	7440-54-2
Ce	0.2	7440-45-1

Ba | 1 | 7440-39-3

RN 632286-96-5 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.24Zr0.52O3)
(9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.52	7440-67-7
Gd	0.24	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

RN 632286-97-6 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe0.24Gd0.2Zr0.56O3)
(9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.56	7440-67-7
Gd	0.2	7440-54-2
Ce	0.24	7440-45-1
Ba	1	7440-39-3

RN 632287-08-2 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe0.2Gd0.4Zr0.4O3) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.4	7440-67-7
Gd	0.4	7440-54-2
Ce	0.2	7440-45-1
Ba	1	7440-39-3

IC ICM H01M008-12

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49

ST solid oxide **proton conducting fuel**
cell electrolyte; barium transition **metal**
rare earth oxide solid **electrolyte**; aluminum barium
zirconium oxide solid **electrolyte fuel**
cell

IT Rare earth oxides

RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
preparation); TEM (Technical or engineered material use); PREP
(Preparation); USES (Uses)

(aluminum barium zirconium transition **metal** oxides,
electrolytes; thin-film barium-transition **metal**
oxide-rare earth oxide **proton-conducting**
solid **electrolytes** for **fuel cells**)

IT Transition **metal** oxides

RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
preparation); TEM (Technical or engineered material use); PREP
(Preparation); USES (Uses)

(barium rare earth oxides, **electrolyte**; thin-film
barium-transition **metal** oxide-rare earth oxide
proton-conducting solid **electrolytes**
for **fuel cells**)

IT Rare earth oxides

RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (barium transition metal oxides, electrolyte;
 thin-film barium-transition metal oxide-rare earth
 oxide proton-conducting solid
 electrolytes for fuel cells)

IT **Ionic conductivity**
Ionic conductors
 (proton; thin-film barium-transition metal
 oxide-rare earth oxide proton-conducting
 solid electrolytes for fuel cells)

IT **Fuel cells**
 (solid electrolyte; thin-film barium-transition
 metal oxide-rare earth oxide proton-
 conducting solid electrolytes for fuel
 cells)

IT **Fuel cell electrolytes**
 (solid-oxide; thin-film barium-transition metal
 oxide-rare earth oxide proton-conducting
 solid electrolytes for fuel cells)

IT 7440-06-4, Platinum, uses
 RL: DEV (Device component use); USES (Uses)
 (electrode; thin-film barium-transition metal
 oxide-rare earth oxide proton-conducting
 solid electrolytes for fuel cells)

IT 134775-34-1P, Barium cerium praseodymium oxide ($\text{BaCe}_{0.8}\text{Pr}_{0.2}\text{O}_3$)
 144378-46-1P, Barium cerium gadolinium oxide ($\text{BaCe}_{0.8}\text{Gd}_{0.2}\text{O}_3$)
 148791-56-4P, Barium cerium dysprosium oxide ($\text{BaCe}_{0.8}\text{Dy}_{0.2}\text{O}_3$)
 148972-97-8P, Barium cerium samarium oxide ($\text{BaCe}_{0.8}\text{Sm}_{0.2}\text{O}_3$)
 162759-81-1P, Barium cerium erbium oxide ($\text{BaCe}_{0.8}\text{Er}_{0.2}\text{O}_3$)
 170023-54-8P, Barium cerium terbium oxide ($\text{BaCe}_{0.8}\text{Tb}_{0.2}\text{O}_3$)
 237055-46-8P, Barium cerium lanthanum oxide ($\text{BaCe}_{0.8}\text{La}_{0.2}\text{O}_3$)
 288865-89-4P, Barium cerium yttrium zirconium oxide
 ($\text{BaCe}_{0.4}\text{Y}_{0.2}\text{Zr}_{0.4}\text{O}_3$) 288866-05-7P, Barium cerium neodymium
 zirconium oxide ($\text{BaCe}_{0.4}\text{Nd}_{0.2}\text{Zr}_{0.4}\text{O}_3$) 288866-24-0P, Barium cerium
 indium zirconium oxide ($\text{BaCe}_{0.4}\text{In}_{0.2}\text{Zr}_{0.4}\text{O}_3$) 288866-28-4P, Barium
 cerium indium zirconium oxide ($\text{BaCe}_{0.5}\text{In}_{0.2}\text{Zr}_{0.3}\text{O}_3$)
 386720-65-6P, Barium cerium gadolinium zirconium oxide
 ($\text{BaCe}_{0.2}\text{Gd}_{0.2}\text{Zr}_{0.6}\text{O}_3$) 632286-92-1P, Barium cerium ytterbium
 zirconium oxide ($\text{BaCe}_{0.4}\text{Yb}_{0.2}\text{Zr}_{0.4}\text{O}_3$) 632286-93-2P, Aluminum
 barium cerium gadolinium oxide ($\text{Al}_{0.02}\text{BaCe}_{0.8}\text{Gd}_{0.2}\text{O}_3$) 632286-94-3P
 632286-95-4P 632286-96-5P, Barium cerium gadolinium
 zirconium oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.24}\text{Zr}_{0.52}\text{O}_3$) 632286-97-6P,
 Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.24}\text{Gd}_{0.22}\text{Zr}_{0.56}\text{O}_3$)
 632286-98-7P 632286-99-8P 632287-00-4P, Aluminum barium cerium
 europium oxide ($\text{Al}_{0.02}\text{BaCe}_{0.8}\text{Eu}_{0.2}\text{O}_3$) 632287-01-5P, Barium cerium
 promethium oxide ($\text{BaCe}_{0.8}\text{Pm}_{0.2}\text{O}_3$) 632287-02-6P, Barium cerium
 holmium oxide ($\text{BaCe}_{0.8}\text{Ho}_{0.2}\text{O}_3$) 632287-03-7P, Barium cerium thulium
 oxide ($\text{BaCe}_{0.8}\text{Tm}_{0.2}\text{O}_3$) 632287-04-8P, Barium cerium lutetium oxide
 ($\text{BaCe}_{0.8}\text{Lu}_{0.2}\text{O}_3$) 632287-05-9P, Barium cerium scandium oxide
 ($\text{BaCe}_{0.8}\text{Sc}_{0.2}\text{O}_3$) 632287-06-0P 632287-07-1P 632287-08-2P
 , Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.2}\text{Gd}_{0.4}\text{Zr}_{0.4}\text{O}_3$)
 632287-09-3P, Barium cerium indium zirconium oxide
 ($\text{BaCe}_{0.1}\text{In}_{0.3}\text{Zr}_{0.6}\text{O}_3$) 632287-10-6P
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
 preparation); TEM (Technical or engineered material use); PREP
 (Preparation); USES (Uses)
 (oxygen-deficient, proton conductors;
 thin-film barium-transition metal oxide-rare earth
 oxide proton-conducting solid
 electrolytes for fuel cells)

L379 ANSWER 39 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:928082 Document No. 140:62132 Current status of metallic
 substrate supported thin-film SOFC at DLR

- stuttgart. Schiller, Guenter; Franco, Thomas; Henne, Rudolf; Lang, Michael; Ruckdaeschel, Robert; Otschik, Peter; Eichler, Klaus (Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Stuttgart, D-70569, Germany). Proceedings - Electrochemical Society, 2001-16(Solid Oxide Fuel Cells VII), 885-894 (English) 2001. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.
- AB A review (12 refs.). The planar **metallic** substrate **supported thin-film SOFC** concept developed at DLR Stuttgart on the basis of advanced plasma spray technol. ("spray concept") enables the fabrication of complete cells with a size of up to 20 + 20 cm². The electrode **layers** and the thin **electrolyte** with a total thickness of the MEA structure of less than 100-120 μ m are consecutively deposited onto a porous **metallic** substrate in a single time- and cost-effective spray procedure. The thin-film cells show high electrochem. performance at reduced operating **temperature** in the **temperature** range 750-800 °C. The present paper describes the current status of the DLR spray concept including fabrication technol. and scale-up aspects, recent developments with materials and components and electrochem. performance of plasma sprayed thin-film **SOFC**.
- CC 52-0 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 55, 56, 72, 76
- ST review SOFC **metal support** DLR stuttgart
- IT Coating process
(plasma spraying; status of **metallic** substrate **supported thin-film SOFC** at DLR stuttgart)
- IT Alloys, uses
Metals, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(porous, substrates; status of **metallic** substrate **supported thin-film SOFC** at DLR stuttgart)
- IT Fuel cells
(solid oxide; status of **metallic** substrate **supported thin-film SOFC** at DLR stuttgart)
- IT Porous materials
(substrates; status of **metallic** substrate **supported thin-film SOFC** at DLR stuttgart)
- L379 ANSWER 40 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:892312 Document No. 139:352742 Method for fabrication of solid polymer **fuel cell**. Hiroi, Osamu; Fukumoto, Hisatoshi; Yoshida, Yasuhiro; Kurata, Tetsuyuki (Mitsubishi Denki Kabushiki Kaisha, Japan). U.S. Pat. Appl. Publ. US 2003211380 A1 20031113, 10 pp. (English). CODEN: USXXCO. APPLICATION: US 2003-429944 20030506. PRIORITY: JP 2002-135831 20020510; JP 2003-104282 20030408.
- AB The invention concerns a solid polymer type **fuel cell** having a polyelectrolyte **film** having a **proton conductivity**; an anode and a cathode arranged on the opposite **sides** of the polyelectrolyte **film**; and a gas flow channel for supplying gas to the both electrodes, the anode and the cathode each being composed of a catalyst **layer** that is in contact with the polyelectrolyte **film** and a gas diffusion **layer** for allowing the diffusion of gas supplied from the gas flow channel to the catalyst **layer**, in which the gas diffusion **layer** included in the cathode electrode is constructed of a carbon-containing material and the **surface** of the carbon-containing material is modified to be hydrophilic.
- IC ICM H01M004-96
ICS H01M008-10; H01M004-94
- INCL 429044000; 429030000
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 38
ST polymer solid type **fuel cell** fabrication
IT Carbon black, uses
RL: CAT (Catalyst use); TEM (Technical or engineered material use);
USES (Uses)
(catalytic **metal supported**; method for
fabrication of solid polymer **fuel cell**)
IT Dew point
(cathode gas; method for fabrication of solid polymer
fuel cell)
IT Oxides (inorganic), uses
RL: TEM (Technical or engineered material use); USES (Uses)
(hydrophilic **coating**; method for fabrication of solid
polymer **fuel cell**)
IT **Coating** materials
(method for fabrication of solid polymer **fuel**
cell)
IT Carbon fibers, uses
RL: DEV (Device component use); USES (Uses)
(method for fabrication of solid polymer **fuel**
cell)
IT Polyesters, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(method for fabrication of solid polymer **fuel**
cell)
IT **Fuel cells**
(solid **electrolyte**; method for fabrication of solid
polymer **fuel cell**)
IT 7631-86-9, Silica, uses 13463-67-7, **Titanium oxide**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**coating**; method for fabrication of solid polymer
fuel cell)
IT 7440-06-4, Platinum, uses 12779-05-4
RL: CAT (Catalyst use); USES (Uses)
(method for fabrication of solid polymer **fuel**
cell)
IT 25038-59-9, Polyethylene terephthalate, uses 322012-68-0, TGP-H
090
RL: TEM (Technical or engineered material use); USES (Uses)
(method for fabrication of solid polymer **fuel**
cell)

L379 ANSWER 41 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:872494 Document No. 139:367512 **Fuel cell** with
solid **electrolytic** membrane and catalyst electrode for
improved cell characteristic and reliability. Imai, Hideto;
Yoshitake, Tsutomu; Shimakawa, Yuichi; Shinko, Takashi; Nakamura,
Arata; Kimura, Hidekazu; Kuroshima, Sadanori; Kubo, Yoshimi (NEC
Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2003317736 A2 20031107, 12
pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-117954
20020419.

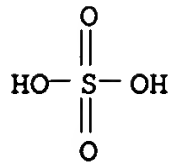
AB **Fuel cell** has **fuel** electrode, to which
liquid fuel is supplied, oxidizer electrode and a solid
electrolyte membrane sandwiched between the fuel electrode
and the oxidizer electrode, wherein a layer containing H₂-containing oxoacid
salt is formed between the fuel electrode or oxidizer
electrode and the solid **electrolyte** membrane, optionally
the solid **electrolyte** membrane contains the H₂-containing
oxoacid **salt**. The catalyst electrode comprises a
substrate, a catalyst layer formed on the substrate, and a layer
containing H₂-containing oxoacid layer. In the **fuel cell**
, the **proton conductivity** is satisfactorily maintained
and the penetration and crossover of liquid fuel are suppressed to
improve cell characteristics and reliability.

IT 7789-16-4, Cesium bisulfate
RL: TEM (Technical or engineered material use); USES (Uses)

(fuel cell with solid electrolytic membrane and catalyst electrode containing H2-containing oxoacid salt for improved cell characteristic and reliability)

RN 7789-16-4 HCAPLUS

CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

IT 7440-05-3, Palladium, uses

RL: TEM (Technical or engineered material use); USES (Uses)
(liquid fuel permeation-preventing layer containing; fuel cell with solid electrolytic membrane and catalyst electrode containing H2-containing oxoacid salt for improved cell characteristic and reliability)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M008-02

ICS C01B019-00; H01M004-86; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST fuel cell hydrogen contg oxyacid salt

IT Fuel cell electrodes

(catalytic; fuel cell with solid electrolytic membrane and catalyst electrode containing H2-containing oxoacid salt for improved cell characteristic and reliability)

IT Fuel cells

Solid electrolytes

(fuel cell with solid electrolytic membrane and catalyst electrode containing H2-containing oxoacid salt for improved cell characteristic and reliability)

IT Zeolites (synthetic), uses

RL: TEM (Technical or engineered material use); USES (Uses)
(liquid fuel permeation-preventing layer containing; fuel cell with solid electrolytic membrane and catalyst electrode containing H2-containing oxoacid salt for improved cell characteristic and reliability)

IT Fuels

(liquid; fuel cell with solid electrolytic membrane and catalyst electrode containing H2-containing oxoacid salt for improved cell characteristic and reliability)

IT 7789-16-4, Cesium bisulfate 120635-35-0 133883-65-5

620970-69-6 620970-70-9 620970-73-2

RL: TEM (Technical or engineered material use); USES (Uses)

(fuel cell with solid electrolytic membrane and catalyst electrode containing H2-containing oxoacid salt for improved cell characteristic and reliability)

IT 7440-05-3, Palladium, uses

RL: TEM (Technical or engineered material use); USES (Uses)
(liquid fuel permeation-preventing layer containing; fuel cell with solid electrolytic membrane and

catalyst electrode containing H₂-containing oxoacid salt for improved cell characteristic and reliability)

L379 ANSWER 42 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:872490 Document No. 139:367511 Manufacture of gas-diffusion electrode for manufacture of solid polymer fuel cell. Tanuma, Toshihiro; Kinoshita, Shinji (Asahi Glass Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003317727 A2 20031107, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-124436 20020425.

AB The electrode which is placed next to an ion-exchange membrane and contains carbon-supported metal catalysts and F-containing ion-exchange resins, is manufactured by (1) mixing the catalysts with the ion-exchange resins in liquid to satisfy WF/WC ratio ≥ 0.01 and < 0.05 (WF = weight of the resins; WC = weight of C in the catalysts) to give a dispersion A having dispersed ≤ 1.0 .

mu.m-catalyst particle ratio to total catalyst particles ≥ 20 volume%, (2) adding the resins to the dispersion A to give a dispersion B satisfying WF/WC ratio 0.5-1.7, and (3) coating with the dispersion B. The electrode formed on the ion-exchange membrane surface is porous, conductive, water-repellent, and durable and gives the cell with high power and durability.

IC ICM H01M004-88

ICS H01M004-86; H01M008-02; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology) Section cross-reference(s): 38

ST solid polymer fuel cell gas diffusion electrode;
metal carbon catalyst fuel cell
electrode; ion exchange fluoropolymer fuel
cell electrode

IT Ion exchangers

(F-containing; manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

IT Fuel cell electrodes

(gas diffusion; manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

IT Catalysts

(manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

IT Carbon black, uses

RL: CAT (Catalyst use); DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)

(manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

IT Fluoropolymers, uses

RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)

(manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

IT 158191-37-8, Flemion S

RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)

(ion-exchange membrane, electrode formed on; manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

IT 7440-06-4, Platinum, uses 7440-18-8, Ruthenium, uses

RL: CAT (Catalyst use); DEV (Device component use); PEP (Physical,

engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

IT 31175-20-9
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (manufacture of gas-diffusion electrode containing metal-carbon catalysts and F-contg ion-exchange resins for solid polymer fuel cell)

L379 ANSWER 43 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:830687 Document No. 140:148997 On the use of Pd filters on proton conducting SOFC ceramics.
 Schober, T. (IFF, Forschungszentrum Juelich, Juelich, 52425, Germany). Ionics, 9(3 & 4), 297-300 (English) 2003. CODEN: IONIFA. ISSN: 0947-7047. Publisher: Institute for Ionics.

AB Ceramic proton conductors are materials which conduct protons under an applied elec. field and permit the construction of a SOFC in analogy to the oxygen ion conductor 8YSZ. Such protonic ceramic fuel cells have been labeled PCFCs to distinguish them from the standard SOFCs. PCFCs have several advantages when compared with standard SOFCs. First, there is no water contamination of the fuel gas. Second, the protonic conductivity may be higher in the intermediate temperature range (550-700°C). Also, the activation energy for proton migration is much lower than that of oxygen ion conduction. In addition, internal reforming is also possible permitting the use of natural gas. An intriguing possibility is the use of palladium filters on the fuel side which only permit the diffusion of protons to the filter-electrolyte interface. This may reduce undesirable mixing of the fuel and the oxygen on either side of the electrolyte. In this work, it is shown that the entry of protons from the Pd into the ceramic conductor is straight forward. Prototype test PCFCs are shown to operate as required. To test the Pd-ceramic proton conductor system a study was undertaken using Pd tubes which were coated with thin layers of the proton conducting ceramics. When flushing the tube insides with H₂ and exposing the outsides to air, Nernst voltages of such electrochem. cells could be recorded as a function of temperature. The present rather preliminary work, however, was hampered by leakage of the thin film HTPC (high temperature proton conductor). Thus, the theor. Nernst voltages were not attained.

IT 191980-68-4, Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O_{8.73})
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (BCN18; Pd filters in proton conducting SOFC ceramics)

RN 191980-68-4 HCAPLUS
 CN Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O_{8.73}) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	8.73	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

IT 7440-05-3, Palladium, uses 37197-23-2
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (Pd filters in **proton conducting SOFC** ceramics)
 RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 37197-23-2 HCAPLUS
 CN Silver alloy, base, Ag 70, Pd 30 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
Ag	70	7440-22-4
Pd	30	7440-05-3

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 57, 76

ST **proton conducting solid oxide fuel cell; palladium filter proton conducting SOFC**

IT Electric **conductors**, ceramic
 Electric potential
 Perovskite-type crystals
 (Pd filters in **proton conducting SOFC** ceramics)

IT **Ionic conductivity**
 (proton; Pd filters in **proton conducting SOFC** ceramics)

IT **Fuel cells**
 (solid oxide; Pd filters in **proton conducting SOFC** ceramics)

IT 191980-68-4, Barium calcium niobium oxide
 (Ba₃Ca_{1.18}Nb_{1.82}O_{8.73})
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (BCN18; Pd filters in **proton conducting SOFC** ceramics)

IT 1333-74-0, Hydrogen, uses
 RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (Pd filters in **proton conducting SOFC** ceramics)

IT 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 37197-23-2 142107-79-7D, Calcium indium zirconium oxide (CaIn_{0.1}Zr_{0.9}O₃), oxygen-depleted 403694-09-7, 8YSZ 653573-09-2D, Barium cerium yttrium zirconium oxide (BaCe_{0.05}Y_{0.15}Zr_{0.8}O₃), oxygen-depleted
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (Pd filters in **proton conducting SOFC** ceramics)

L379 ANSWER 44 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:763604 Document No. 140:79659 Differential resistance analysis of protonic ceramic fuel cells for measuring bulk conductivity. Coors, W. Grover; Zhong, Dalong (Protonetics International Inc., Golden, CO, USA). Solid State Ionics, 162-163, 283-290 (English) 2003. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..
 AB A technique, called differential resistance anal., was developed to

determine the bulk conductivity of protonic ceramic electrolyte in hydrogen/air fuel cells under load. For these expts., identical specimens of the protonic ceramic $\text{BaCe}_{0.9}\text{Y}_{0.1}\text{O}_{3-\alpha}$ (BCY10) were prepared with thicknesses of 240, 560, 790, and 1150 μm with thin film platinum electrodes. The current-voltage (I-V) characteristic curves for each specimen were obtained between 600 and 800°, and the slope of each I-V curve was determined in the ohmic region between 10 and 20 mA, giving the total effective area specific resistance (ASR cell) of the cell under load as a function of temperature. The bulk electrolyte resistivity was found by taking the difference in resistance of two cells divided by the difference in electrolyte thickness. The bulk conductivity of the electrolyte measured at 1000 K by this technique was 5 mS/cm or less, depending on the overall electrolyte thickness, much lower than the values obtained by impedance spectroscopy. Also, the activation energy for bulk conduction was higher than expected for pure protonic transport. This paper attempts to correlate the two measurement techniques and explain the apparent discrepancies.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L379 ANSWER 45 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:763550 Document No. 140:184546 Synthesis and characterisation of cermet anodes for SOFCs with a proton-conducting ceramic phase. Mather, G. C.; Figueiredo, F. M.; Jurado, J. R.; Frade, J. R. (Camino de Valdelatas s/n, Instituto de Ceramica y Vidrio, CSIC, Madrid, 28049, Spain). Solid State Ionics, 162-163, 115-120 (English) 2003. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Cermet anodes of $\text{Ni-CaZr}_{0.95}\text{Y}_{0.05}\text{O}_{2.975}$ (Ni-CZY) and $\text{Ni-SrZr}_{0.95}\text{Y}_{0.05}\text{O}_{2.975}$ (Ni-SZY) were synthesized by combustion followed by sintering and reduction to Ni metal. The anodes were co-pressed and co-sintered on green YSZ electrolyte to produce anode/electrolyte/anode assemblies with planar electrodes of thickness, $\approx 150 \mu\text{m}$. The anode microstructures are composed of a uniform and homogeneous distribution of submicron Ni metal and ceramic phases. Preliminary impedance spectroscopy results on sym. cells indicate that the polarization resistance is composed of two or more pH₂O-sensitive contributions and is dependent on the composition of the proton-conducting ceramic.

IT 162824-28-4P, Strontium yttrium zirconium oxide ($\text{SrY}_{0.05}\text{Zr}_{0.95}\text{O}_{2.98}$)

RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); USES (Uses) (sintered anode cermet with nickel; synthesis and characterization of nickel cermet anodes for SOFCs with proton-conducting ceramic phase)

RN 162824-28-4 HCAPLUS

CN Strontium yttrium zirconium oxide ($\text{SrY}_{0.05}\text{Zr}_{0.95}\text{O}_{2.98}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	2.98	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72, 75, 76

ST cermet anode SOFCs proton conducting
ceramic SEM XRD impedance; nickel zirconium calcium yttrium

- strontium oxide conductance orthorhombic perovskite
- IT Electric impedance
 - (of **fuel cells**; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT Polarization resistance
 - (on sym. **fuel cells**; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT Crystal structure types
 - (orthorhombic; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT Electrodes
 - (planar, for **fuel cells**; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT Ionic conductivity
 - (**proton**; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT **Fuel cells**
 - (solid oxide; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT Cermet
 - Combustion synthesis
 - Electric **conductors**, ceramic
 - Fuel cell** anodes
 - Microstructure
 - Reduction
 - Sintering
 - (synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT 114168-16-0, TZ-8Y
 - RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 - (YSZ, cermet anodes attached to; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT 57-13-6, Urea, reactions
 - RL: RCT (Reactant); RACT (Reactant or reagent)
 - (combustion fuel; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT 1313-99-1, Nickel oxide (NiO), uses
 - RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 - (phase in anode cermet before reduction; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT 12036-39-4P, Strontium zirconium oxide (SrZrO₃)
 - RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 - (phase in anode cermet; synthesis and characterization of nickel cermet anodes for SOFCs with **proton-conducting** ceramic phase)
- IT 162824-28-4P, Strontium yttrium zirconium oxide (SrY_{0.05}Zr_{0.95}O_{2.98}) 657398-56-6P, Calcium yttrium zirconium oxide (CaY_{0.05}Zr_{0.95}O_{2.98})
 - RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); USES (Uses)
 - (sintered anode cermet with nickel; synthesis and

- characterization of nickel cermet anodes for SOFCs with
proton-conducting ceramic phase)
- IT 64417-98-7, Yttrium zirconium oxide
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); PROC (Process); USES
(Uses)
(synthesis and characterization of nickel cermet anodes for
SOFCs with proton-conducting ceramic
phase)
- IT 7440-02-0P, Nickel, uses
RL: DEV (Device component use); SPN (Synthetic preparation); PREP
(Preparation); USES (Uses)
(synthesis and characterization of nickel cermet anodes for
SOFCs with proton-conducting ceramic
phase)
- IT 7732-18-5, Water, uses
RL: NUU (Other use, unclassified); USES (Uses)
(synthesis and characterization of nickel cermet anodes for
SOFCs with proton-conducting ceramic
phase)
- IT 1333-74-0, Hydrogen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(synthesis and characterization of nickel cermet anodes for
SOFCs with proton-conducting ceramic
phase)
- IT 1314-23-4, Zirconia, uses
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); PROC (Process); USES
(Uses)
(yttria-stabilized; synthesis and characterization of nickel
cermet anodes for SOFCs with proton-
conducting ceramic phase)
- IT 1314-36-9, Yttria, uses
RL: DEV (Device component use); PEP (Physical, engineering or
chemical process); PYP (Physical process); PROC (Process); USES
(Uses)
(zirconia stabilized by; synthesis and characterization of nickel
cermet anodes for SOFCs with proton-
conducting ceramic phase)

L379 ANSWER 46 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:738047 Document No. 139:248046 Method for manufacturing polymer
electrolyte type fuel cell. Ueyama,
Yasuhiro; Watanabe, Masaru; Kamikihara, Nobuyuki; Yasumoto, Eiichi
(Matsushita Electric Industrial Co., Ltd., Japan). PCT Int. Appl.
WO 2003077336 A1 20030918, 50 pp. DESIGNATED STATES: W: CA, CN,
JP, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT,
LU, MC, NL, PT, SE, TR. (Japanese). CODEN: PIXXD2. APPLICATION:
WO 2003-JP2973 20030313. PRIORITY: JP 2002-70350 20020314.

- AB A method for manufacturing a polymer electrolyte type
fuel cell having a polymer electrolyte
film and, arranged on both sides thereof, electrodes
containing a catalyst layer and a gas diffusion layer being contacted
with the polymer electrolyte film, and a separator
contacted with the gas diffusion layer, characterized in that, in
the formation of the catalyst layer through applying a paste containing
a carbon fine powder comprising a noble metal catalyst
carried on a specific support, followed by drying, the
electrode is controlled to have a percentage of the
surface area occupied by cracked portions below a predetd.
acceptable level, through adjusting at least (1) the film thickness
of the catalyst layer, (2) the type of the catalyst comprising
carbon and a noble metal carried thereon and (3) the
drying rate for the solvent in the paste. For example, a film
thickness of 10 to 25 μm , a carbon carrying 5 to 20 wt
% of platinum, and a drying rate for the solvent of 2.5 to 20

mg/cm²/ min are employed.

IC ICM H01M004-88
ICS H01M008-02; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 67

ST polymer **electrolyte fuel cell** precious
metal platinum catalyst drying

IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst **support**; manufacture of platinum catalyst layer
supported on carbon black for polymer **electrolyte**
-type **fuel cell**)

IT Drying
Fuel cells
(manufacture of platinum catalyst layer **supported** on carbon
black for polymer **electrolyte**-type **fuel**
cell)

IT 7440-06-4, Platinum, uses
RL: CAT (Catalyst use); EPR (Engineering process); PEP (Physical,
engineering or chemical process); PROC (Process); USES (Uses)
(catalyst; manufacture of platinum catalyst layer **supported**
on carbon black for polymer **electrolyte**-type
fuel cell)

L379 ANSWER 47 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:697777 Document No. 139:367423 **Fuel cells**
operating in the **"gap" temperature** regime.
Smotkin, Eugene S. (Department of Chemistry, University of Puerto
Rico @ Rio Piedras, San Juan, 00931, P. R.). Preprints of Symposia
- American Chemical Society, Division of Fuel Chemistry, 48(2),
887-888 (English) 2003. CODEN: PSADFZ. ISSN: 1521-4648.
Publisher: American Chemical Society, Division of Fuel Chemistry.

AB An intermediate **temperature electrolyte** system
enabling **fuel cell** operation between 250
°C and 400°C, i.e., in the **gap** between a PEM
fuel cell and a molten carbonate **fuel**
cell (MCFC) has the benefits of enhanced ORR kinetics, CO
tolerance, and a simplified fuel processor without the materials
thermal instability problems of the high **temperature** systems.
Addnl., the **gap temperature** region enables downward
scalability for portable power, a power regime not accessible by
MCFCs. Inorg. electronically insulating **proton**
conductors are candidates for **gap**
electrolytes and a composite membrane **electrolyte**
was prepared by coating **ammonium polyphosphate** and
silica spheres on a Pd foil. A **fuel cell**
operating in the **gap** regime with this **electrolyte**
was demonstrated. Within the **gap** regime, a
water-gas-shift reactor and a PROX reactor will not be needed and
the intermediate **temperature** operation will permit downward
scalability for portable power.

IT 7440-05-3, Palladium, uses
RL: DEV (Device component use); USES (Uses)
(**fuel cell** operating at intermediate
temps. with **electrolyte** coated on)

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST phosphoric acid silica palladium composite **electrolyte**
fuel cell
IT Polyphosphoric acids

- RL: DEV (Device component use); USES (Uses)
 (ammonium salts, composite with silica,
 electrolyte; fuel cell operating at
 intermediate temps. with)
- IT Fuel cell electrolytes
 Fuel cells
 (fuel cell operating at intermediate
 temps.)
- IT 7631-86-9, Silica, uses
 RL: DEV (Device component use); USES (Uses)
 (composite with ammonium polyphosphate, electrolyte;
 fuel cell operating at intermediate
 temps. with)
- IT 1333-74-0, Hydrogen, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (fuel cell operating at intermediate
 temps. fueled with)
- IT 630-08-0, Carbon monoxide, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (fuel cell operating at intermediate
 temps. fueled with hydrogen containing)
- IT 7440-05-3, Palladium, uses
 RL: DEV (Device component use); USES (Uses)
 (fuel cell operating at intermediate
 temps. with electrolyte coated on)
- IT 7782-44-7, Oxygen, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical
 process); PROC (Process)
 (in fuel cell operating at intermediate
 temps.)

L379 ANSWER 48 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:677263 Document No. 140:130991 Development of low-cost

alloy supported SOFCs. Visco, Steven

J.; Jacobson, Craig P.; Villareal, Igor; Leming, Andy; Matus, Yuriy;

De Jonghe, Lutgard C. (Materials Sciences Division, Lawrence

Berkeley National Laboratory, Berkeley, CA, 94720, USA).

Proceedings - Electrochemical Society, 2003-7(Solid Oxide Fuel Cells

VIII (SOFC VIII)), 1040-1050 (English) 2003. CODEN: PESODO. ISSN:

0161-6374. Publisher: Electrochemical Society.

- AB The LBNL group has been developing ferritic steel supported
 solid oxide fuel cells. The use of ferritic
 steel as a support for electrode supported solid
 oxide fuel cells greatly reduces the raw
 materials cost and improves the strength of the thin-film
 cells. The basic design includes the use of a high-strength FeCr
 support, a thin interlayer electrode (Ni-YSZ or
 other), and a thin electrolyte film. The entire
 structure is fabricated through co-firing of the three
 layers in a reducing environment. This paper describes the
 preliminary performance of the metal supported
 cells, as well as a variety of possible interlayer electrodes.

- IT 7440-02-0, Nickel, uses
 RL: DEV (Device component use); TEM (Technical or engineered
 material use); USES (Uses)
 (development of low-cost alloy supported
 SOFCs)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72, 76

- ST alloy support SOFC low cost
- IT Polyoxyalkylenes, uses
Polyvinyl butyrals
RL: NUU (Other use, unclassified); USES (Uses)
(development of low-cost alloy supported SOFCs)
- IT Fuel cells
(solid oxide; development of low-cost alloy supported SOFCs)
- IT Alloys, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(supports; development of low-cost alloy supported SOFCs)
- IT 1313-99-1, Nickel oxide NiO, uses 7440-02-0, Nickel, uses 7440-06-4, Platinum, uses 12017-94-6, Chromium lanthanum oxide (CrLaO₃) 12060-59-2, Strontium titanium oxide (SrTiO₃) 12597-68-1, Stainless steel, uses 148595-66-8, Cobalt iron lanthanum strontium oxide (Co_{0.2}Fe_{0.8}La_{0.6}Sr_{0.4}O₃) 254760-18-4, Lanthanum strontium titanium oxide (La_{0.65}Sr_{0.35}TiO₃) 403694-09-7, 8YSZ 439900-64-8, Cobalt strontium titanium yttrium oxide (Co_{0.05}Sr_{0.85}Ti_{0.95}Y_{0.1}O₃) 649758-60-1
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(development of low-cost alloy supported SOFCs)
- IT 57-11-4, Stearic acid, uses 67-63-0, 2-Propanol, uses 25322-68-3, PEG
RL: NUU (Other use, unclassified); USES (Uses)
(development of low-cost alloy supported SOFCs)
- IT 11100-60-0, Steel, chromium, uses
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(ferritic; development of low-cost alloy supported SOFCs)
- L379 ANSWER 49 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:677189 Document No. 140:18256 Improvement of LSM cathode for high power density SOFCs. Wang, Wei Guo; Barfod, Rasmus; Larsen, Peter Halvor; Kammer, Kent; Bentzen, Janet J.; Hendriksen, Peter Vang; Mogensen, Mogens (Materials Research Department, Riso National Laboratory, Roskilde, DK-4000, Den.). Proceedings - Electrochemical Society, 2003-7(Solid Oxide Fuel Cells VIII (SOFC VIII)), 400-408 (English) 2003. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.
- AB Optimization of processing (La_{1-x}Sr_x)₂MnO_{3+δ} composite cathodes led to high-performance SOFCs. Sym. cells were prepared with (La_{1-x}Sr_x)₂MnO_{3+δ} composite cathodes on yttria-stabilized zirconia tapes. A homogeneous microstructure with submicron pores was obtained that resulted in a low area-specific polarization resistance of 0.09 at 850° and 0.31 Ω·cm² at 750°, while area-specific series resistances were 0.29 and 0.61 Ω·cm², resp., in a sym. cell with a yttria-stabilized zirconia tape 185 .μm thick. The low area-specific polarization and series resistance are attributed to long triple-phase boundaries and good adhesion between cathode and electrolyte. Impedance measurements indicated an activation energy of the cathode of 1.26 eV. Anode-supported cells with an active area of 4+4 cm² show a high power d. of 1.44 W/cm² at 850° and 0.8 W/cm² at 750° at a cell voltage of 0.7 V.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L379 ANSWER 50 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:677168 Document No. 140:18253 Characterization of cathode

supported thin film electrolytes. Becker, M.;
Weber, A.; Mueller, A. C.; Ivers-Tiffée, E. (Institut fuer
Werkstoffe, Institut fuer Werkstoffe der Elektrotechnik Universitaet
Karlsruhe, Adenauerring 20, Karlsruhe, 76131, Germany). Proceedings
- Electrochemical Society, 2003-7(Solid Oxide Fuel Cells VIII (SOFC
VIII)), 222-228 (English) 2003. CODEN: PESODO. ISSN: 0161-6374.
Publisher: Electrochemical Society.

- AB The lower operating **temperature** limit of SOFCs is
governed by the thermally activated conductance of the
electrolyte as well as by the polarization resistance of the
electrodes. For operating **temps.** lower than 800.
degree.C, supported thin film
electrolytes can be applied to reduce the ohmic losses
within a single cell. In this work, cathode **supported**
thin film electrolytes from state-of-the-art
ceria and zirconia **electrolyte** powders were realized using
mass production technologies. The conductivity of the **electrolyte**
thin film was determined by impedance spectroscopy and the
microstructure was characterized by electron microscopy methods
(SEM). The conductivity of the **electrolyte thin film**
(thickness < 10 **.mu.m**) depends on grain size and
porosity. The conductivity values of state-of- the-art **electrolyte**
substrates (thickness > 150 **.mu.m**) have not been
achieved so far. However, the contribution of the
electrolyte thin film to the area
specific resistance is significantly smaller
compared to the ASR of an **electrolyte supported**
single cell.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 57, 76
- ST cathode **supported thin film oxide**
electrolytes SOFC
- IT Cathodes
Electrolytes
Films
(cathode **supported thin film electrolytes**)
- IT Grain size
Porosity
(effect on elec. conductivity of cathode **supported thin**
film oxide electrolytes for SOFC's)
- IT Electric conductivity
Electric impedance
Microstructure
(of cathode **supported thin film oxide**
electrolytes for SOFC's)
- IT **Fuel cells**
(solid oxide; cathode **supported thin film**
electrolytes for)
- IT 1306-38-3, Ceria, uses
RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(gadolinia doped; cathode **supported thin film**
electrolytes for SOFC's)
- IT 157975-54-7, Lanthanum manganese strontium oxide La0.75MnSr0.203
RL: DEV (Device component use); USES (Uses)
(thin **film oxide electrolytes for**
SOFC's supported on cathode)
- IT 1314-23-4, Zirconia, uses
RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(yttria doped; cathode **supported thin film**
electrolytes for SOFC's)

L379 ANSWER 51 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:631929 **Fuel cells** operating in the "Gap

" **temperature** regime. Smotkin, Eugene S. (Department of Chemistry, University of Puerto Rico, San Juan, 00931, P. R.). Abstracts of Papers, 226th ACS National Meeting, New York, NY, United States, September 7-11, 2003, FUEL-177. American Chemical Society: Washington, D. C. (English) 2003. CODEN: 69EKY9.

AB An intermediate **temperature electrolyte** system enabling **fuel cell** operation at 250°C to 400°C (i.e. in the **gap** between the PEM **fuel cell** and the MCFC) has the benefits of enhanced ORR kinetics, CO tolerance, and a simplified fuel processor without the materials thermal instability problems of the high **temperature** systems. We report the first demonstration of a **fuel cell** operating in the **gap** regime. The innovation is a **support** structure that enables the use of very thin inorg. electronically insulating **proton conductors** (EIPCs). The composite **electrolyte** system is based on an EIPC **supported** on a thin **metal hydride** membrane that is strong, flexible, and has excellent hydrogen transport properties. The **metal hydride** is coated on one or both **sides** with a thin **film** of the inorg. EIPC. By themselves, neither the **metal hydride** foil nor the EIPC can make an acceptable **fuel cell** membrane. The **metal** alone, being an electronic **conductor**, would short circuit the cathode and anode; the EIPC alone has poor mech. properties and may also be fuel-permeable. Together, the two components form an electronically insulating, mech. strong, fuel impermeable thin membrane that is ideally suited to the intermediate **temperature** regime.

L379 ANSWER 52 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:581659 Document No. 139:397834 **Metal-Supported Solid Oxide Fuel Cells**. Villarreal, I.; Jacobson, C.; Leming, A.; Matus, Y.; Visco, S.; De Jonghe, L. (Ikerlan Technological Research Center, Parque Tecnológico de Alava, Alava, Minano Menor, 01510, Spain). Electrochemical and Solid-State Letters, 6(9), A178-A179 (English) 2003. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.

AB Low-cost, colloidal deposition methods were used to produce novel solid oxide **fuel cell** (SOFC) structures on **metal alloy support** electrodes. Yttria-stabilized zirconia (YSZ) **films** were deposited on **Fe-chrome supports** on top of a thin **Ni/YSZ catalytic layer** and sintered at 1350° in a reducing atmospheric Dense, 20 .mu.m YSZ **electrolyte films** were obtained on highly porous stainless steel substrates. **Metal-supported fuel cells** were tested at 800 and 900°, achieving power densities of over 200 mW/cm2 at 900° using Pt paste cathodes. The cells showed excellent resistance to thermal cycling, and open up a low-cost path to SOFC commercialization.

IT 7440-02-0, Nickel, uses
RL: DEV (Device component use); USES (Uses)
(steel coated with; metal-supported solid oxide fuel cells with)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST stainless steel **support** anode solid oxide **fuel cell**

- IT **Fuel cell anodes**
(metal-supported solid oxide fuel cells)
- IT **Fuel cells**
(solid oxide; metal-supported solid oxide fuel cells)
- IT 7440-06-4, Platinum, uses
RL: DEV (Device component use); USES (Uses)
(cathode containing; metal-supported solid oxide fuel cells with)
- IT 115135-47-2, Cobalt iron lanthanum strontium oxide ($\text{Co}_{0.8}\text{Fe}_{0.2}\text{La}_{0.6}\text{Sr}_{0.4}\text{O}_3$)
RL: DEV (Device component use); USES (Uses)
(cathode; metal-supported solid oxide fuel cells with)
- IT 11109-78-7
RL: DEV (Device component use); USES (Uses)
(nickel- and yttria-stabilized zirconia-coated ; metal-supported solid oxide fuel cells with)
- IT 7440-02-0, Nickel, uses 64417-98-7, Yttrium zirconium oxide
RL: DEV (Device component use); USES (Uses)
(steel coated with; metal-supported solid oxide fuel cells with)
- IT 1314-23-4, Zirconium oxide (ZrO_2), uses
RL: DEV (Device component use); USES (Uses)
(yttria-doped; metal-supported solid oxide fuel cells with)
- IT 1314-36-9, Yttrium oxide (Y_2O_3), uses
RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)
(zirconia doped with; metal-supported solid oxide fuel cells with)

L379 ANSWER 53 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:560619 Document No. 139:294488 Fe-based catalysts for the reduction of oxygen in polymer electrolyte membrane fuel cell conditions: determination of the amount of peroxide released during electroreduction and its influence on the stability of the catalysts. Lefevre, Michel; Dodelet, Jean-Pol (INRS-Energie et Materiaux, Varennes, 1020, Can.). Electrochimica Acta, 48(19), 2749-2760 (English) 2003. CODEN: ELCAAV. ISSN: 0013-4686. Publisher: Elsevier Science B.V..

AB Fe-based catalysts have been prepared by pyrolyzing ClFeTMPP (Cl-Fe tetramethoxyphenyl porphyrin) or Fe acetate adsorbed on PTCDA (perylene tetracarboxylic dianhydride) or on prepyrolyzed PTCDA (p-PTCDA). The catalysts which were already well characterized in terms of active FeN_4/C and FeN_2/C catalytic sites (J. Phys. Chemical B 106 (2002) 8705) are now characterized by RRDE expts. to determine the values of the apparent number of electron transferred (n) and the percentage of peroxide ($\%\text{H}_2\text{O}_2$) released during the oxygen reduction reaction (ORR) in H_2SO_4 at pH 1. A direct correlation is found between the relative abundance of the FeN_2/C catalytic site in these materials, their catalytic activity and the value of n . The correlation is inverse for $\%\text{H}_2\text{O}_2$. The best catalysts at their maximum catalytic activity are characterized by $n > 3.9$ and $\%\text{H}_2\text{O}_2 < 5\%$, equivalent to a value of $\%\text{H}_2\text{O}_2$ released by a 2 weight% Pt/C catalyst. It is shown that even low peroxide levels of the order of 5 vol% in H_2SO_4 are able to decompose the catalytic sites releasing iron ions in the H_2SO_4 solution. The loss of catalytic activity correlates directly with the loss of iron ions by these catalysts. All the catalysts have been tested at the cathode of single membrane electrode assemblies (MEAs). The slow decrease in performance in fuel cell stability tests is interpreted as the result of the detrimental effect that has H_2O_2 ,

- released during ORR, on the chemical integrity of the nonnoble metal catalytic sites at work at the fuel cell cathodes.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 29, 67, 72
- IT **Fuel cells**
Polymer electrolytes
(Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT Electric potential
(effect on H₂O₂ formation on Fe-based catalysts in polymer electrolyte membrane fuel cell)
- IT Catalysts
(electrocatalysts; Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT **Electrolytic cells**
(membrane; Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT **Surface analysis**
(of Fe-based catalysts in polymer electrolyte membrane fuel cell)
- IT **Electrolytic polarization**
(of Fe-based catalysts in polymer electrolyte membrane fuel cell conditions in H₂SO₄ solution)
- IT Reduction, electrochemical
(of oxygen in polymer electrolyte membrane fuel cell conditions on Fe-based catalysts)
- IT Thermal decomposition
(preparation of Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell by)
- IT Electrodes
(rotating disk electrodes; reduction of oxygen on Fe-based catalysts in polymer electrolyte membrane fuel cell on stability of the catalysts)
- IT 37191-17-6
RL: CAT (Catalyst use); USES (Uses)
(Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT 7782-44-7, Oxygen, reactions
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT 128-69-8, Perylene tetracarboxylic dianhydride
RL: NUU (Other use, unclassified); USES (Uses)
(bare and prepyrolyzed; reduction of oxygen in polymer electrolyte membrane fuel cell on iron acetate adsorbed on)
- IT 7439-89-6, Iron, uses
RL: CAT (Catalyst use); USES (Uses)
(containing; Fe-based catalysts for reduction of oxygen in polymer electrolyte membrane fuel cell conditions)
- IT 7722-84-1, Hydrogen peroxide, processes
RL: CPS (Chemical process); FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); FORM (Formation, nonpreparative); PROC (Process)
(formation by oxygen reduction on Fe-based catalysts in polymer electrolyte membrane fuel cell conditions)
- IT 7664-93-9, Sulfuric acid, uses

- RL: NUJ (Other use, unclassified); USES (Uses)
(oxygen reduction on Fe-based catalysts in polymer
electrolyte membrane fuel cell
conditions in solution containing)
- IT 2140-52-5, Iron acetate
RL: CAT (Catalyst use); USES (Uses)
(reduction of oxygen in polymer **electrolyte membrane**
fuel cell on iron acetate adsorbed on perylene
tetracarboxylic dianhydride)
- IT 7440-44-0, Carbon, uses
RL: DEV (Device component use); MSC (Miscellaneous); USES (Uses)
(**support** for Fe-based catalysts in polymer
electrolyte membrane fuel cell)
- L379 ANSWER 54 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:531579 Document No. 139:103729 Manufacture of solid polymer-type
fuel cell and manufacture of gas diffusion electrode. Tanuma,
Toshihiro; Kinoshita, Shinji; Shimoda, Hiroshi (Asahi Glass Co.,
Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003197205 A2 20030711, 6
pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-393246
20011226.
- AB The invention relates to a gas diffusion electrode of a solid
polymer-type **fuel cell** which is disposed
adjacent to an ion-exchange membrane and contains a
catalyst and a F-based ion-exchange resin and a
metal supported on carbon. The catalyst (Wc) and
the ion exchange resin (Wf) are mixed and dispersed in a
liquid to form a solution (A) at a weight ratio $0.05 \leq Wf/Wr \leq 0.5$
so that the catalyst particle with $\leq 1 \mu m$
occupies ≥ 30 volume% in the particle size distribution. The
ion-exchange resin is added to the solution (A) so as to
satisfy $Wf/Wc = 0.7-1.7$ to form a solution (B). The solution (B) is used
to form the gas diffusion electrode. The process was able to form
the gas diffusion electrode having high durability.
- IC ICM H01M004-88
ICS H01M008-02; H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 67
- ST solid polymer **fuel cell** gas diffusion electrode;
ion exchange resin catalysts **fuel cell**
- IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst **support**; gas diffusion electrode of solid
polymer-type fuel cell)
- IT Catalysts
Fuel cell cathodes
Ion exchangers
(gas diffusion electrode of solid polymer-type **fuel**
cell)
- L379 ANSWER 55 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:521059 Document No. 139:119789 Metal/ceria water-gas
shift catalysts for automotive polymer **electrolyte**
fuel cell systems. Myers, Deborah J.; Krebs, John
F.; Carter, J. David; Kumar, Romesh; Krumpelt, Michael (Chemical
Technology Division, Argonne National Laboratory, Argonne, IL,
60439-4837, USA). Pre-Print Archive - American Institute of
Chemical Engineers, [Spring National Meeting], New Orleans, LA,
United States, Mar. 11-14, 2002, 2308-2312. American Institute of
Chemical Engineers: New York, N. Y. (English) 2002. CODEN: 69DXU5.
- AB Several doped ceria catalysts were tested on their activity to
promote the water-gas shift (WGS) reaction. A Pt/doped
ceria/ γ -alumina catalyst was found that had a WGS activity
comparable to the com. Cu/ZnO catalyst, and unlike other
com. WGS catalysts it had not to be activated by in situ reduction, and
showed no loss of activity upon exposure to air at 21-550°.

The catalyst showed activity in the **temperature** range 180-400° and could be used in high and low **temperature** shift reactions. This properties of the Pt/doped ceria catalyst made it suitable for fuel processing in mobile applications, but the high costs of the catalysts might prohibit their use in light duty vehicles.

IT 7440-05-3, **Palladium**, uses
 RL: CAT (Catalyst use); MOA (Modifier or additive use); USES (Uses)
 (dopant; **metal/ceria** water-gas shift catalysts for
 automotive polymer **electrolyte fuel**
 cell systems)

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 67

ST was gas shift catalyst ceria **fuel cell** hydrogen

IT Electric vehicles
 (automobiles; **metal/ceria** water-gas shift catalysts for
 automotive polymer **electrolyte fuel**
 cell systems)

IT Automobiles
 (elec.; **metal/ceria** water-gas shift catalysts for
 automotive polymer **electrolyte fuel**
 cell systems)

IT **Surface area**
 Water gas shift reaction catalysts
 (**metal/ceria** water-gas shift catalysts for automotive
 polymer **electrolyte fuel cell**
 systems)

IT **Fuel cells**
 (polymer-electrolyte; **metal/ceria** water-gas
 shift catalysts for automotive polymer **electrolyte**
fuel cell systems)

IT Fuel gas manufacturing
 (water gas manufacturing; **metal/ceria** water-gas shift
 catalysts for automotive polymer **electrolyte**
fuel cell systems)

IT 7440-05-3, **Palladium**, uses 7440-06-4, **Platinum**,
 uses 7440-18-8, **Ruthenium**, uses 7440-48-4, **Cobalt**, uses
 RL: CAT (Catalyst use); MOA (Modifier or additive use); USES (Uses)
 (dopant; **metal/ceria** water-gas shift catalysts for
 automotive polymer **electrolyte fuel**
 cell systems)

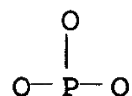
IT 1306-38-3, **Ceria**, uses 117655-32-0, **Cerium gadolinium oxide**
 (Ce_{0.8}Gd_{0.2}O_{1.9}) 197149-44-3, **Cerium samarium oxide**
 (Ce_{0.85}Sm_{0.15}O_{1.92}) 461412-51-1, **Cerium praseodymium zirconium**
 oxide (Ce_{0.8}Pr_{0.02}Zr_{0.17}O_{1.99}) 461412-52-2, **Cerium yttrium**
 zirconium oxide (Ce_{0.8}Y_{0.1}Zr_{0.1}O_{1.95}) 461412-53-3, **Cerium**
 gadolinium zirconium oxide (Ce_{0.8}Gd_{0.02}Zr_{0.17}O_{1.99})
 RL: CAT (Catalyst use); USES (Uses)
 (**metal/ceria** water-gas shift catalysts for automotive
 polymer **electrolyte fuel cell**
 systems)

IT 1333-74-0P, **Hydrogen**, preparation
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (**metal/ceria** water-gas shift catalysts for automotive
 polymer **electrolyte fuel cell**
 systems)

IT 1344-28-1, **Alumina**, uses
 RL: CAT (Catalyst use); TEM (Technical or engineered material use);
 USES (Uses)

(support; metal/ceria water-gas shift
catalysts for automotive polymer electrolyte
fuel cell systems)

L379 ANSWER 56 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:435140 Document No. 139:9315 Solid acid electrolytes for
electrochemical devices. Haile, Sossina M.; Chisholm, Calum; Merle,
Ryan B.; Boysen, Dane A.; Narayanan, Sekharipuram R. (USA). U.S.
Pat. Appl. Publ. US 2003104258 A1 20030605, 29 pp., Cont.-in-part of
U.S. 6,468,684. (English). CODEN: USXXCO. APPLICATION: US
2002-211882 20020801. PRIORITY: US 1999-PV116741 19990122; US
1999-PV146946 19990802; US 1999-PV151811 19990830; US 1999-439377
19991115.
AB Improved solid acid electrolyte materials, methods of synthesizing
such materials, and electrochem. devices incorporating such
materials are provided. The stable electrolyte material comprises a
solid acid capable undergoing rotational disorder of oxyanion groups
and capable of extended operation at elevated temps.,
i.e., solid acids having hydrogen bonded anion groups; a
superprotonic, trigonal, tetragonal, or cubic, disordered phase; and
capable of being operating at temps. of .apprx.100°
and higher.
IT 13569-78-3P, Cesium phosphite (Csh2PO3)
RL: DEV (Device component use); SPN (Synthetic preparation); PREP
(Preparation); USES (Uses)
(solid acid electrolytes for electrochem. devices)
RN 13569-78-3 HCAPLUS
CN Phosphonic acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)

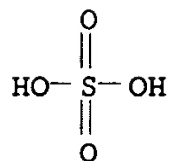


● Cs

ONE OR MORE TAUTOMERIC DOUBLE BONDS NOT DISPLAYED IN THE STRUCTURE
IC ICM H01M008-10
ICS H01M006-18; C01B025-30; C01B025-45
INCL 429033000; 423306000; 423307000; 429304000; 429321000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 72, 76
ST **electrolyte** solid acid electrochem device; **fuel**
cell electrolyte solid acid; capacitor
electrolyte solid acid; sensor **electrolyte** solid
acid; hydrogen sepn membrane **electrolyte** solid acid
IT Conducting polymers
Electrolytic capacitors
Fuel cell electrolytes
Ion exchange
Sensors
Solid electrolytes
(solid acid **electrolytes** for electrochem. devices)
IT 13569-78-3P, Cesium phosphite (Csh2PO3) 22021-54-1P,
Barium hydrogen silicate BaH2SiO4 22112-04-5P, Calcium sodium
hydrogen silicate CaNaHSiO4 42035-64-3P 60746-55-6P, Strontium
germanate(IV) (SrH2GeO4)
RL: DEV (Device component use); SPN (Synthetic preparation); PREP
(Preparation); USES (Uses)
(solid acid electrolytes for electrochem. devices)

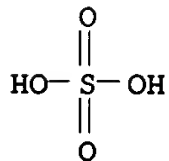
L379 ANSWER 57 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:253809 Document No. 138:404193 Stability of the dry

- proton conductor CsHSO₄ in hydrogen atmosphere.
 Yang, B.; Kannan, A. M.; Manthiram, A. (Materials Science and Engineering Program, The University of Texas at Austin, Austin, TX, 78712, USA). Materials Research Bulletin, 38(4), 691-698 (English) 2003. CODEN: MRBUAC. ISSN: 0025-5408. Publisher: Elsevier Science Inc..
- AB The suitability of the dry p conductor, CsHSO₄ as an electrolyte for fuel cells, was assessed by studying its chemical stability in a H₂ atmosphere in the presence of the electrocatalyst, Pt/C. X-ray diffraction and differential scanning calorimetric (DSC) data indicate that CsHSO₄ decomps. to Cs₂SO₄ and H₂S at 150° in a H₂ atmosphere when it is mixed with Pt/C catalyst but, it is stable under identical conditions in the absence of the Pt/C catalyst. Although thin composite membranes (.apprx.80 µm) prepared with poly(vinylidene fluoride) and CsHSO₄ exhibit high p conductivity at 150-200°, which is adequate for fuel cell applications, development of compatible non-platinum alloys or transition metal oxide catalysts is needed before CsHSO₄ can be used as an electrolyte in fuel cells. Processing procedures must be optimized to obtain dense, gas-impermeable membranes suitable for fuel cell application.
- IT 10294-54-9, Cesium sulfate (Cs₂SO₄)
 RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative) (decomposition of dry proton conductor, cesium bisulfate, in hydrogen atmospheric)
- RN 10294-54-9 HCAPLUS
- CN Sulfuric acid, dicesium salt (8CI, 9CI) (CA INDEX NAME)



●2 Cs

- IT 7789-16-4, Cesium sulfate (CsHSO₄)
 RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses) (stability of dry proton conductor, cesium bisulfate, in hydrogen atmospheric)
- RN 7789-16-4 HCAPLUS
- CN Sulfuric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 76
- ST cesium bisulfate proton conductor stability
 hydrogen fuel cell electrolyte;
 fuel cell membrane polyvinylidene fluoride cesium

- bisulfate
 -IT **Fuel cell separators**
 (fabrication of **fuel cell** membrane by casting
 slurry of poly(vinylidene fluoride) and cesium bisulfate)
 IT Fluoropolymers, uses
 RL: DEV (Device component use); USES (Uses)
 (fabrication of **fuel cell** membrane by casting
 slurry of poly(vinylidene fluoride) and cesium bisulfate)
 IT **Ionic conductors**
 (**protonic**; stability of dry **proton**
 conductor, cesium bisulfate, in hydrogen atmospheric)
 IT **Fuel cell electrolytes**
 (stability of dry **proton conductor**, cesium
 bisulfate, in hydrogen atmospheric)
 IT 7783-06-4, Hydrogen sulfide (H₂S), formation (nonpreparative)
 10294-54-9, Cesium sulfate (Cs₂SO₄)
 RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
 (decomposition of dry **proton conductor**, cesium
 bisulfate, in hydrogen atmospheric)
 IT 24937-79-9, Poly(vinylidene fluoride)
 RL: DEV (Device component use); USES (Uses)
 (fabrication of **fuel cell** membrane by casting
 slurry of poly(vinylidene fluoride) and cesium bisulfate)
 IT 7789-16-4, Cesium sulfate (CsHSO₄)
 RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or
 reagent); USES (Uses)
 (stability of dry **proton conductor**, cesium
 bisulfate, in hydrogen atmospheric)
 IT 1333-74-0, Hydrogen, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (stability of dry **proton conductor**, cesium
 bisulfate, in hydrogen atmospheric)
 IT 7440-06-4, Platinum, uses
 RL: CAT (Catalyst use); USES (Uses)
 (stability of dry **proton conductor**, cesium
 bisulfate, in hydrogen atmospheric with)
 IT 7440-44-0, Carbon, uses
 RL: CAT (Catalyst use); USES (Uses)
 (**support**; stability of dry **proton**
 conductor, cesium bisulfate, in hydrogen atmospheric with)

 L379 ANSWER 58 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2003:200697 Document No. 138:240574 Structure of electrochemical
 reaction baseplate. Yo, Ko-Shen; Tsai, Min-Chieh; Wu, Ja-Lin; Luo,
 Lei-Hsi (Industrial Technology Research Institute, Taiwan). Jpn.
 Kokai Tokkyo Koho JP 2003077489 A2 20030314, 5 pp. (Japanese).
 CODEN: JKXXAF. APPLICATION: JP 2001-256664 20010827.
 AB The title baseplate has high functionality and is suited for use in
 manufacturing of fuel cell, electrochem. reactor, or detector. The
 baseplate is made of a plate material having multiple ditches of a
 desired width/depth ratio, multiple though-holes of desired
 dimension formed on the baseplate, electrolysis layer formed on the
surface the inside though-holes, a selective
insulation layer formed on the electrolysis layer, a porous
 elec. conductive layer formed on the insulation layer, and a
 catalyst layer formed on the conductive layer. The double layered
 material is formed by sandwiching a selective insulation layer with
 a pair of baseplates.
 IT 7440-05-3, Palladium, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (structure of electrochem. reaction baseplate for manufacturing of fuel
 cell, electrochem. reactor, or detector)
 RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M008-02
ICS C25B009-10; C25B011-03; H01M004-86
CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 76
IT **Electrolytic cells**
Fuel cells
Sensors
(structure of electrochem. reaction baseplate for manufacturing of
fuel cell, electrochem. reactor, or detector)
IT 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses
7440-42-8, Boron, uses 7440-57-5, Gold, uses 7782-40-3, Diamond,
uses 7782-42-5, Graphite, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(structure of electrochem. reaction baseplate for manufacturing of fuel
cell, electrochem. reactor, or detector)

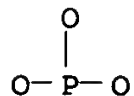
L379 ANSWER 59 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2003:118173 Document No. 138:156301 Method of synthesis of solid acid
electrolytes for electrochemical devices. Haile, Sossina M.;
Chisholm, Calum; Merle, Ryan B.; Boysen, Dane; Narayanan,
Sekharipuram R. (California Institute of Technology, USA). PCT Int.
Appl. WO 2003012894 A2 20030213, 51 pp. DESIGNATED STATES: W: AE,
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR,
CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU,
ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV,
MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD,
SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA,
ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI,
FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG,
TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-US24564
20020801. PRIORITY: US 2001-PV309807 20010801; US 2002-PV355362
20020206.

AB Improved solid acid electrolyte materials, methods of synthesizing
such materials, and electrochem. devices incorporating such
materials are disclosed. The stable electrolyte material comprises
a solid acid capable undergoing rotational disorder of oxyanion
groups and capable of extended operation at elevated temps
., i.e., solid acids having hydrogen bonded anion groups; a
superprotonic, trigonal, tetragonal, or cubic, disordered phase; and
capable of being operating at temps. of .apprx.100°
and higher.

IT 13569-78-3P
RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
preparation); PREP (Preparation); USES (Uses)
(method of synthesis of solid acid electrolytes for electrochem.
devices)

RN 13569-78-3 HCAPLUS

CN Phosphonic acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

ONE OR MORE TAUTOMERIC DOUBLE BONDS NOT DISPLAYED IN THE STRUCTURE

IC ICM H01M

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 72, 76

ST **fuel cell solid acid electrolyte**
 synthesis; electrochem device solid acid electrolyte
 synthesis

IT Glass, uses
Metals, uses
 Polymers, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (binder; method of synthesis of solid acid electrolytes for
 electrochem. devices)

IT Battery electrolytes
 Conducting polymers
 Electric conductivity
Fuel cell electrolytes
 Ion exchange
 Membranes, nonbiological
 Solid electrolytes
 (method of synthesis of solid acid electrolytes for
 electrochem. devices)

IT Ionic conductivity
 (proton; method of synthesis of solid acid electrolytes
 for electrochem. devices)

IT 67-56-1, Methanol, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (fuel cell; method of synthesis of solid acid
 electrolytes for electrochem. devices)

IT 13569-78-3P 22021-54-1P, Barium hydrogen silicate BaH₂SiO₄
 22112-04-5P, Calcium sodium hydrogen silicate CaNaHSiO₄
 22112-05-6P 28263-33-4P 42035-64-3P, Silicic acid (H₄SiO₄),
 disodium salt, pentahydrate 60746-55-6P
 RL: DEV (Device component use); PRP (Properties); SPN (Synthetic
 preparation); PREP (Preparation); USES (Uses)
 (method of synthesis of solid acid electrolytes for electrochem.
 devices)

L379 ANSWER 60 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:36428 Document No. 138:89590 Method for preparation of
 hydrogenated fullerene by hydrogenation of fullerene using
 ruthenium, palladium, iridium, platinum, or cobalt
 supported on activated alumina. Ozaki, Toshihiko; Tai,
 Yutaka (National Institute of Advanced Industrial Science and
 Technology, Japan). Jpn. Kokai Tokkyo Koho JP 2003012572 A2
 20030115, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
 2001-191005 20010625.

AB Hydrogenated fullerene is prepared by conversion of C₆₀ fullerene into
 from C₆₀H₁₈ to C₆₀H₃₆ under mild hydrogenation conditions using one
 of Ru, Pd, Ir, Pt, and Co metal
 supported on an activated alumina. Also claimed is a method
 for storage of hydrogen by above conversion of C₆₀ fullerene into
 from C₆₀H₁₈ to C₆₀H₃₆. The hydrogenation catalyst is prepared by
 impregnation of activated alumina in an aqueous solution of metal
 salt selected from ruthenium chloride, palladium
 chloride, iridium chloride, platinum chloride, and cobalt nitrate,
 evaporation of water, drying, and firing at 400-800°. The
 catalyst obtained is hydrogenated at 400-800° under hydrogen
 atmospheric before its use. This process highly efficiently gives in high
 yield with high selectivity and without decomposition, hydrogenated
 fullerene which is useful as light-weight hydrogen storage material
 with higher hydrogen storage ratio (.apprx.2.4 weight % and .apprx.4.8
 weight% C₆₀H₁₈ and C₆₀H₃₆, resp.) as compared to metal-based
 hydrogen storage material (e.g. 1.4 weight% for LaNi₅H₆) and may find
 an application for fuel cell automobile. Thus,
 50 mg C₆₀ fullerene and 10 weight% Co/10 g activated alumina in 200 mL
 toluene were hydrogenated in an autoclave at 150° for 300 min
 to give a mixture of hydrogenated C₆₀ fullerene containing from C₆₀H₁₈ to
 C₆₀H₃₆ with 100% conversion ratio.

IT 7440-05-3D, Palladium, supported on

activated alumina
RL: CAT (Catalyst use); USES (Uses)
(preparation of hydrogenated fullerene as hydrogen storage material by
hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
supported on activated alumina)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C07C013-64
ICS B01J023-42; B01J023-44; B01J023-46; B01J023-75; B01J037-02;
B01J037-08; B01J037-18; C07C005-02; C07B061-00

CC 25-29 (Benzene, Its Derivatives, and Condensed Benzenoid Compounds)

ST hydrogenated fullerene prepn hydrogen storage material; fullerene
hydrogenation; ruthenium **supported** activated alumina
hydrogenation catalyst; **palladium supported**
activated alumina hydrogenation catalyst; iridium **supported**
activated alumina hydrogenation catalyst; platinum **supported**
activated alumina hydrogenation catalyst; cobalt **supported**
activated alumina hydrogenation catalyst

IT Fullerenes
RL: SPN (Synthetic preparation); PREP (Preparation)
(hydrogenated; preparation of hydrogenated fullerene as hydrogen
storage material by hydrogenation of fullerene using Ru,
Pd, Ir, Pt, or Co **supported** on activated
alumina)

IT Hydrogenation
Hydrogenation catalysts
(preparation of hydrogenated fullerene as hydrogen storage material by
hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
supported on activated alumina)

IT 1344-28-1, Alumina, uses
RL: CAT (Catalyst use); USES (Uses)
(activated, catalyst **support**; preparation of hydrogenated
fullerene as hydrogen storage material by hydrogenation of
fullerene using Ru, Pd, Ir, Pt, or Co **supported**
on activated alumina)

IT 7439-88-5D, Iridium, **supported** on activated alumina
7440-05-3D, Palladium, **supported** on
activated alumina 7440-06-4D, Platinum, **supported** on
activated alumina 7440-18-8D, Ruthenium, **supported** on
activated alumina 7440-48-4D, Cobalt, **supported** on
activated alumina
RL: CAT (Catalyst use); USES (Uses)
(preparation of hydrogenated fullerene as hydrogen storage material by
hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
supported on activated alumina)

IT 1333-74-0, Hydrogen, reactions 7647-10-1, Palladium
chloride 10025-83-9, Iridium chloride 10049-08-8, Ruthenium
chloride 10141-05-6, Cobalt nitrate 12648-47-4, Platinum
chloride 99685-96-8, C60 Fullerene
RL: RCT (Reactant); RACT (Reactant or reagent)
(preparation of hydrogenated fullerene as hydrogen storage material by
hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
supported on activated alumina)

IT 99685-96-8DP, C60 Fullerene, hydrogenated 130797-14-7P,
Octadecahydrofullerene-C60 130797-17-0P,
Hexatriacontahydrofullerene-C60
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of hydrogenated fullerene as hydrogen storage material by
hydrogenation of fullerene using Ru, Pd, Ir, Pt, or Co
supported on activated alumina)

E379 ANSWER 61 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2003:35310 Document No. 138:58968 Hydrogen generation via methane cracking for integrated heat and electricity production using a fuel cell. Sioui, Daniel R.; Towler, Gavin P.; Oroskar, Anil R.; Zhou, Lubo; Dunne, Stephen R.; Kulprathipanja, Santi; Galperin, Leonid B.; Modica, Frank S.; Voskoboinikov, Timur V. (UOP LLC, USA). U.S. US 6506510 B1 20030114, 14 pp. (English). CODEN: USXXAM.

APPLICATION: US 2000-737990 20001215.

AB A novel integrated system for the co-production of heat and electricity for residences or com. buildings is based on the cracking of hydrocarbons to generate hydrogen for a fuel cell. Compared to prior art reforming methods for hydrogen production, the cracking reaction provides an input stream to the fuel cell that is essentially free of CO, a known poison to the anode catalyst in many fuel cell designs, such as PEM fuel cells. The cracking reaction is coupled with an air or steam regeneration cycle to reactivate that cracking catalyst for further use. This regeneration can provide a valuable source of heat or furnace fuel to the system. A novel control method for system adjusts the durations of the cracking and regeneration cycles to optimize the recovery of reaction heat.

IT 7440-05-3, Palladium, uses 12735-99-8

RL: TEM (Technical or engineered material use); USES (Uses)

(H-permeable membrane; hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 12735-99-8 HCAPLUS

CN Silver alloy, nonbase, Ag,Pd (9CI) (CA INDEX NAME)

Component Component
Registry Number

=====+=====

Ag 7440-22-4

Pd 7440-05-3

IT 7439-89-6, Iron, uses 7440-02-0,

Nickel, uses

RL: CAT (Catalyst use); USES (Uses)

(hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)

RN 7439-89-6 HCAPLUS

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IT 7440-32-6, Titanium, uses

RL: TEM (Technical or engineered material use); USES (Uses)

(hydrogen generation via methane cracking for integrated heat and electricity production using fuel cell)

RN 7440-32-6 HCAPLUS

CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

IT 7440-62-2, Vanadium, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(support; hydrogen generation via methane cracking for
integrated heat and electricity production using fuel cell)
RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM H01M008-04
ICS H01M008-12; H01M002-14
INCL 429017000; 429026000; 429039000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology).
Section cross-reference(s): 49
IT Hydrides
RL: FMU (Formation, unclassified); TEM (Technical or engineered
material use); FORM (Formation, nonpreparative); USES (Uses)
(hydrogen generation via methane cracking for integrated heat and
electricity production using fuel cell)
IT Fuel cells
(solid electrolyte; hydrogen generation via methane
cracking for integrated heat and electricity production using
fuel cell)
IT Clays, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(support; hydrogen generation via methane cracking for
integrated heat and electricity production using fuel cell)
IT 7440-05-3, Palladium, uses 12735-99-8
71174-06-6 93977-71-0
RL: TEM (Technical or engineered material use); USES (Uses)
(H-permeable membrane; hydrogen generation via methane cracking
for integrated heat and electricity production using fuel cell)
IT 1302-88-1, Cordierite 1309-48-4, Magnesia, uses 7439-89-6
, Iron, uses 7440-02-0, Nickel, uses
RL: CAT (Catalyst use); USES (Uses)
(hydrogen generation via methane cracking for integrated heat and
electricity production using fuel cell)
IT 7440-32-6, Titanium, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(hydrogen generation via methane cracking for integrated heat and
electricity production using fuel cell)
IT 1314-23-4, Zirconia, uses 1344-28-1, Alumina, uses 7440-03-1,
Niobium, uses 7440-25-7, Tantalum, uses 7440-62-2,
Vanadium, uses 7440-67-7, Zirconium, uses 7631-86-9,
Silica, uses 12597-68-1, Stainless steel, uses 13463-67-7,
Titania, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(support; hydrogen generation via methane cracking for
integrated heat and electricity production using fuel cell)

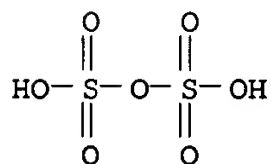
L379 ANSWER 62 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2002:902388 Document No. 138:124940 Instability of Sulfate and
Selenate Solid Acids in Fuel Cell Environments.
Merle, Ryan B.; Chisholm, Calum R. I.; Boysen, Dane A.; Haile,
Sossina M. (California Institute of Technology Materials Science,
Pasadena, CA, 91125, USA). Energy & Fuels, 17(1), 210-215 (English)
2003. CODEN: ENFUEM. ISSN: 0887-0624. Publisher: American
Chemical Society.

AB The chemical and thermal stability of several solid acid compds. under
fuel cell operating conditions was investigated,

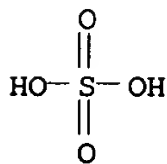
primarily by thermogravimetric methods. Thermal decomposition of CsHSO₄, a material which has shown promise as an alternative **electrolyte** for proton exchange membrane (PEM) **fuel cells**, initiates decomposition at .apprx.175° under inert conditions. The overall decomposition process can be expressed as $2\text{CsHSO}_4 \rightarrow \text{Cs}_2\text{SO}_4 + \text{H}_2\text{O} + \text{SO}_3$, with Cs₂S₂O₇ appearing as an intermediate byproduct at slow heating rates. Under reducing conditions, chemical decomposition can occur via reaction with hydrogen according to $2\text{CsHSO}_4 + 4\text{H}_2 \rightarrow \text{Cs}_2\text{SO}_4 + 4\text{H}_2\text{O} + \text{H}_2\text{S}$. In the absence of **fuel cell** catalysts, this reduction reaction is slow; however, materials such as Pt, Pd, and WC are highly effective in catalyzing the reduction of sulfur and the generation of H₂S. In the case of M₃H(XO₄)₂ compds. (M = Cs, NH₄, or Rb; X = S or Se), a similar reduction reaction occurs: $2\text{M}_3\text{H}(\text{XO}_4)_2 + 4\text{H}_2 \rightarrow 3\text{M}_2\text{XO}_4 + 4\text{H}_2\text{O} + \text{H}_2\text{X}$. In an operational **fuel cell** based on CsHSO₄, performance degraded with time, presumably as a result of H₂S poisoning of the anode catalyst. The performance loss was recoverable by exposure of the **fuel cell** to air at 160°.

IT 50992-48-8P, Disulfuric acid, dicesium salt
 RL: BYP (Byproduct); FMU (Formation, unclassified); FORM (Formation, nonpreparative); PREP (Preparation)
 (formation of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
 RN 50992-48-8 HCAPLUS
 CN Disulfuric acid, dicesium salt (9CI) (CA INDEX NAME)



●2 Cs

IT 10294-54-9, Cesium sulfate
 RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
 (formation of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane **fuel cells**)
 RN 10294-54-9 HCAPLUS
 CN Sulfuric acid, dicesium salt (8CI, 9CI) (CA INDEX NAME)



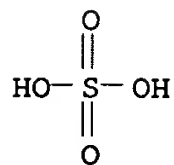
●2 Cs

IT 7789-16-4, Cesium hydrogen sulfate 63317-98-6
 RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 (**fuel cell electrolyte**; instability of alkali metal and ammonium bisulfates and biselenates as solid acid **electrolytes** in proton-exchange-membrane)

fuel cells)

RN 7789-16-4 HCAPLUS

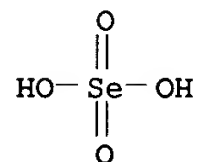
CN Sulfuric acid, monocation salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 63317-98-6 HCAPLUS

CN Selenic acid, ammonium salt (2:3) (9CI) (CA INDEX NAME)

● 3/2 NH₃

IT 7440-05-3, Palladium, uses

RL: CAT (Catalyst use); USES (Uses)

(thermal decomposition catalyst; instability of alkali metal
and ammonium bisulfates and biselenates as solid acid
electrolytes in proton-exchange-membrane **fuel**
cells)

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 78

ST **fuel cell cesium bisulfate solid acid**
electrolyte; hydrogen sulfide poisoning **fuel**
cell anode sulfate decompn; alkali **metal** bisulfate
solid acid **fuel cell electrolyte**

IT Acids, uses

RL: DEV (Device component use); NUU (Other use, unclassified); USES
(Uses)

(inorg., solid; instability of alkali **metal** and
ammonium bisulfates and biselenates as solid acid
electrolytes in proton-exchange-membrane **fuel**
cells)

IT **Fuel cell electrolytes****Fuel cell separators**

(instability of alkali **metal** and ammonium bisulfates
and biselenates as solid acid **electrolytes** in
proton-exchange-membrane **fuel cells**)

IT Thermal decomposition

(of inorg. solid acids; instability of alkali **metal** and
ammonium bisulfates and biselenates as solid acid
electrolytes in proton-exchange-membrane **fuel**

- cells)
- IT Battery anodes
(slow poisoning of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 50992-48-8P, Disulfuric acid, dicesium salt
RL: BYP (Byproduct); FMU (Formation, unclassified); FORM (Formation, nonpreparative); PREP (Preparation)
(formation of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 7446-11-9, Sulfur trioxide, formation (nonpreparative) 7783-06-4, Hydrogen sulfide, formation (nonpreparative) 10294-54-9, Cesium sulfate
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(formation of; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 7789-16-4, Cesium hydrogen sulfate 13775-30-9 63317-98-6 71555-62-9 231277-45-5, Cesium phosphate sulfate (Cs₂(H₂PO₄)(HSO₄))
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(fuel cell electrolyte; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 7664-93-9D, Sulfuric acid, alkali metal hydrogen and ammonium hydrogen salts 7783-08-6D, Selenic acid, alkali metal hydrogen and ammonium hydrogen salts
RL: DEV (Device component use); NUU (Other use, unclassified); USES (Uses)
(fuel cell electrolytes; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- IT 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 12070-12-1, Tungsten carbide (WC)
RL: CAT (Catalyst use); USES (Uses)
(thermal decomposition catalyst; instability of alkali metal and ammonium bisulfates and biselenates as solid acid electrolytes in proton-exchange-membrane fuel cells)
- L379 ANSWER 63 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2002:886578 Document No. 137:387085 Porous metal support for cell stack and cell plate for solid oxide fuel cell. Shibata, Itaru; Yamanaka, Mitsugu; Sato, Fumitoshi; Hatano, Shoji; Kushibiki, Keiko; Hara, Naoki; Fukuzawa, Tatsuhiro; Uchiyama, Makoto (Nissan Motor Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2002334706 A2 20021122, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-137049 20010508.
- AB The title support is equipped with a porous metal body for connecting to a cell stack and a reinforcement made of a material having resistance to oxidation and reduction The title cell plate is equipped with the above support connected to an anode layer or a cathode layer of the fuel cell. The support has high strength and thermal deformation resistance.
- IT 7440-02-0, Nickel, uses 7440-22-4, Silver, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(reinforced porous metal support for cell stack and cell plate for solid oxide fuel cell)

RN 7440-02-0 HCAPPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-22-4 HCAPPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IT 12735-99-8
RL: TEM (Technical or engineered material use); USES (Uses)
(reinforcement; reinforced porous metal support
for cell stack and cell plate for solid oxide fuel
cell)

RN 12735-99-8 HCAPPLUS
CN Silver alloy, nonbase, Ag,Pd (9CI) (CA INDEX NAME)

Component Component
Registry Number

=====+=====

Ag 7440-22-4
Pd 7440-05-3

IC ICM H01M008-02
ICS H01M008-02; H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST porous metal support reinforcement solid oxide
fuel cell
IT Fuel cells
(solid electrolyte; reinforced porous metal
support for cell stack and cell plate for solid oxide
fuel cell)
IT 7440-02-0, Nickel, uses 7440-22-4,
Silver, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(reinforced porous metal support for cell
stack and cell plate for solid oxide fuel cell
)
IT 11101-13-6 11101-28-3 11105-45-6 12606-02-9, Inconel
12649-48-8 12728-71-1 12735-99-8 66174-72-9
175783-53-6
RL: TEM (Technical or engineered material use); USES (Uses)
(reinforcement; reinforced porous metal support
for cell stack and cell plate for solid oxide fuel
cell)

L379 ANSWER 64 OF 116 HCAPPLUS COPYRIGHT 2005 ACS on STN
2002:849988 Document No. 137:355431 Metal-supported
solid electrolyte electrochemical cell and multi-cell reactors
incorporating same. Tunney, Cathal Joseph; Roy, Robert Donald;
McClure, Fraser (3825892 Canada Inc., Can.; Alberta Research Council
Inc.). PCT Int. Appl. WO 2002089243 A2 20021107, 61 pp. DESIGNATED
STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA,
CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE,
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL,
PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG,
US, UZ, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM,
CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL,
PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO
2002-CA582 20020426. PRIORITY: US 2001-2001/PV28685U 20010427; US

2001-2001/PV30302U 20010703; US 2001-2001/PV326561 20011002.

AB The invention provides a **metal-supported** solid electrolyte electrochem. cell, multi cell reactor assemblies incorporating a plurality of such cells, and processes of forming the electrochem. cells. In one embodiment, the electrochem. cell includes a central electrolyte membrane, first and second perforated **metallic layers** adhered to each of the major **surfaces** of the central electrolyte membrane, and first and second outer, non-porous electrolyte **layers** formed above the **metallic layers**. In another embodiment, first and second inner, porous electrolyte **layers** are sandwiched on either **side** of the central membrane, between the first and second **metallic layers**. The electrochem. cell is thus generally formed from ceramic material as thin **layers supported** on non-porous, robust **metallic layers**, designed to behave as though made of **metal**. Preferably, the electrochem. cell includes **metallurgically** bonded elec. interconnects and/or gas seals.

IT 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-22-4, Silver, uses 7440-47-3, Chromium, uses

RL: DEV (Device component use); USES (Uses)
 (metal-supported solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

RN 7440-47-3 HCAPLUS

CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

IC ICM H01M008-12

ICS H01M008-24; B01D053-32; B01J019-00; C01B003-38

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 48, 49, 55, 72

ST electrochem cell **metal supported** solid electrolyte; fuel cell **metal supported** solid electrolyte; oxygen concn cell **metal supported** solid electrolyte; reactor multiple cell **metal supported** solid electrolyte

IT Sol-gel processing
 (coating; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Brazing
 (inert atmospheric; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Electric contacts
 Electrodeposition
 Electron beam evaporation
 Interconnections, electric
 Oxidation catalysts
 Perovskite-type crystals
 Photolithography
 Reactors
 Reforming catalysts
 Seals (parts)
 Sputtering
 (**metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Oxides (inorganic), uses
 Rare earth **metals**, uses
 RL: CAT (Catalyst use); USES (Uses)
 (**metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Hydrocarbons, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
 (**metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Oxidation
 (partial, cell; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Etching
 (photochem.; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Fuel gas manufacturing
 (reforming; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Coating process
 (sol-gel; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Fuel cells
 (solid electrolyte; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Alloys, uses
 RL: DEV (Device component use); USES (Uses)
 (super alloys, Ni-bases; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Brazing
 (vacuum; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT Nickel alloy, base
 RL: DEV (Device component use); USES (Uses)
 (superalloy; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT 7782-44-7P, Oxygen, preparation
 RL: PUR (Purification or recovery); PREP (Preparation)
 (concentration cell; **metal-supported** solid electrolyte electrochem. cell and multi-cell reactors incorporating same)

IT 1304-76-3, Bismuth oxide, uses 1306-38-3, Ceria, uses
 RL: DEV (Device component use); USES (Uses)
 (doped; **metal-supported** solid electrolyte

- electrochem. cell and multi-cell reactors incorporating same)
- IT 7705-08-0, Ferric chloride, processes
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
 (etchant; **metal-supported** solid electrolyte
 electrochem. cell and multi-cell reactors incorporating same)
- IT 12597-68-1, Stainless steel, uses
 RL: DEV (Device component use); USES (Uses)
 (ferritic; **metal-supported** solid electrolyte
 electrochem. cell and multi-cell reactors incorporating same)
- IT 57285-40-2, **Chromium lanthanum strontium oxide**
 RL: CAT (Catalyst use); USES (Uses)
 (**metal-supported** solid electrolyte
 electrochem. cell and multi-cell reactors incorporating same)
- IT 1314-23-4, Zirconia, uses 7440-02-0, **Nickel**,
 uses 7440-05-3, **Palladium**, uses 7440-06-4,
 Platinum, uses 7440-22-4, **Silver**, uses
 7440-47-3, **Chromium**, uses 7440-57-5, Gold, uses
 11122-73-9 20667-12-3, **Silver oxide** 55575-02-5, Cerium
 gadolinium oxide 94076-32-1, Haynes 230
 RL: DEV (Device component use); USES (Uses)
 (**metal-supported** solid electrolyte
 electrochem. cell and multi-cell reactors incorporating same)
- IT 1314-36-9, Yttria, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (zirconia stabilized with, **coating; metal-**
supported solid electrolyte electrochem. cell and
 multi-cell reactors incorporating same)
- L379 ANSWER 65 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2002:719422 Document No. 138:109502 **Temperature-Dependence**
 of Methanol Oxidation Rates at PtRu and Pt Electrodes. Wakabayashi,
 Noriaki; Uchida, Hiroyuki; Watanabe, Masahiro (Clean Energy Research
 Center, Yamanashi University, Takeda 4, Kofu, 400-8511, Japan).
 Electrochemical and Solid-State Letters, 5(11), E62-E65 (English)
 2002. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical
 Society.
- AB High **temperature** operation of direct methanol **fuel**
cells is essential from the viewpoint of achieving a high
 performance with reduced amts. of Pt electrocatalysts used. A
 thin-layer flow cell of 0.1 mm **gap** is applied to evaluate
 the activity of PtRu (46 atom % Ru) alloy and Pt electrodes for
 methanol oxidation reaction (MOR) in a wide **temperature** range from
 20 to 120° in 1 M MeOH + 0.1 M HClO₄ solution under pressurized
 operation. The steady electrocatalytic activity could be evaluated
 by linear potential-sweep voltammetry under a certain
electrolyte flow rate (> 0.2 mL/s), which eliminated an
 effect of the oxidation current of hydrogen evolved at the proximate
 counter cathode. Onset potentials [vs. reversible hydrogen
 electrode (RHE)] for the MOR shifted linearly to less pos.
 potentials with elevating **temperature**, e.g., from 0.45 V (at
 20°) to 0.34 V (at 120°) on the PtRu electrode and
 from 0.66 to 0.52 V on the Pt electrode, resp. A low apparent
 activation energy of 16 kJ/mol for the MOR was found on PtRu at 0.45
 to 0.55 V, which was smaller than that of 24 kJ/mol on Pt at 0.70 V.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST methanol oxidn electrochem cell platinum ruthenium electrode
temp effect
- IT Oxidation kinetics
 (electrochem.; **temperature**-dependence of methanol oxidation
 rates at PtRu alloy and Pt electrodes)
- IT **Surface roughness**
 (of Pt and PtRu electrodes; **temperature**-dependence of
 methanol oxidation rates at PtRu alloy and Pt electrodes)
- IT Cyclic voltammetry
 Electric current-potential relationship

Fuel cell electrodes
 Linear-sweep voltammetry
 Overvoltage
 Oxidation, electrochemical
 (temperature-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)

IT Electrochemical cells
 (thin-layer flow; temperature-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)

IT 7601-90-3, Perchloric acid, uses
 RL: DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (aqueous solution, electrolyte; temperature-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)

IT 7440-57-5, Gold, uses
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (disk, electrode support; temperature-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)

IT 7440-06-4, Platinum, uses 488118-24-7
 RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); USES (Uses)
 (sputter-coated electrode; temperature-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)

IT 67-56-1, Methanol, uses
 RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 (temperature-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)

IT 124-38-9, Carbon dioxide, formation (nonpreparative)
 RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
 (temperature-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)

IT 1333-74-0P, Hydrogen, preparation
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (temperature-dependence of methanol oxidation rates at PtRu alloy and Pt electrodes)

L379 ANSWER 66 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2002:268457 Document No. 136:281515 Steam reforming method for producing hydrogen-rich gas without supplying external heat. Kaneko, Tomoko; Yoshida, Noriko; Yamashita, Toshio; Kawasaki, Terufumi (Hitachi Ltd., Japan; Babcock-Hitachi K. K.). Jpn. Kokai Tokkyo Koho JP 2002104808 A2 20020410, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-299102 20000927.

AB A source gas containing O (or air), hydrocarbons, and steam is brought in contact with a catalyst for simultaneously accelerating the oxidation reaction and steam-reforming reaction of the hydrocarbons. The catalyst comprises Pd, Pt, Ru, or Rh, optionally with Ni, Co, Fe, Ag, Cu, Zn, Cr, and/or rare earth metals supported on a porous carrier comprising Al-containing oxide. In the catalyst, amts. of the active elements for accelerating the reactions are regulated for balancing the exothermic heat from the oxidation reaction and the endothermic heat from the steam-reforming reaction, so that the temperature of the whole catalyst can be kept at a desired temperature without supplying heat from the exterior.

IT 7439-91-0, Lanthanum, uses
 RL: CAT (Catalyst use); USES (Uses)
 (carrier; steam reforming method for producing H-rich gas by using catalyst without supplying external heat)

RN 7439-91-0 HCAPLUS
 CN Lanthanum (8CI, 9CI) (CA INDEX NAME)

La

IT 7440-02-0, Nickel, uses 7440-05-3,
Palladium, uses 7440-22-4, Silver, uses
7440-47-3, Chromium, uses 7440-50-8,
Copper, uses
RL: CAT (Catalyst use); USES (Uses)
(steam reforming method for producing H-rich gas by using
catalyst without supplying external heat)
RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM C01B003-40
ICS B01J023-10; B01J032-00; C01B003-48; H01M008-06; H01M008-10
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 52
ST steam reforming catalyst temp control hydrogen prodn
IT Fuel cells
(solid electrolyte; steam reforming method for
producing H-rich gas by using catalyst without supplying external
heat)
IT Rare earth metals, uses
RL: CAT (Catalyst use); USES (Uses)
(steam reforming method for producing H-rich gas by using
catalyst without supplying external heat)
IT 1302-88-1, Cordierite 1302-93-8, Mullite 1344-28-1, Alumina,
uses 7439-91-0, Lanthanum, uses
RL: CAT (Catalyst use); USES (Uses)
(carrier; steam reforming method for producing H-rich gas by
using catalyst without supplying external heat)
IT 7439-89-6, Iron, uses 7440-02-0, Nickel
, uses 7440-05-3, Palladium, uses 7440-06-4,
Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium,

uses 7440-22-4, Silver, uses 7440-47-3
 , Chromium, uses 7440-48-4, Cobalt, uses
 7440-50-8, Copper, uses 7440-66-6, Zinc, uses
 RL: CAT (Catalyst use); USES (Uses)
 (steam reforming method for producing H-rich gas by using
 catalyst without supplying external heat)

L379 ANSWER 67 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2002:199509 Document No. 137:9494 Ceramic-based materials for
 electrochemical applications. Linkov, V.; Petrik, L.; Vaivars, G.;
 Maluleke, A.; Gericke, G. (Inorganic Porous Media Group, University
 of the Western Cape, Bellville, S. Afr.). Macromolecular Symposia,
 178(Polymer Characterization and Materials Science), 153-168
 (English) 2002. CODEN: MSYMEC. ISSN: 1022-1360. Publisher:
 Wiley-VCH Verlag GmbH.

AB A review. Novel catalytic ceramic-based materials that
 simultaneously possess high surface area and adsorptive
 capacity, with proton and/or electron conducting properties, were
 developed for electrocatalytic and waste-stream treatment processes.
 These novel inorg. **proton conducting** membranes
 were produced by incorporating inorg. low-temperature
proton conductors such as polymeric phosphates of
 polyvalent metals into the porous structure of different
 active or inert substrates such as ceramics (in the form of tubes,
 disks and paper), zeolites or carbon cloth. Electrocatalytic
 activity was obtained by coating electroconductive **surface**
 layers that acted both as electrode and catalyst. Bench scale and
 pilot scale test reactors were built and commissioned. Comparison
 with existing technologies was undertaken for several applications.
 Such high surface-area inorg. materials that
support nanoscale metal clusters are being tested
 as electrode materials in anodic oxidation, inorg. **fuel**
cells and hydrogen generation.

CC 57-0 (Ceramics)

Section cross-reference(s): 52, 60, 72

ST review ceramic membrane **proton conducting**
 wastewater treatment phenol oxidn; ceramic membrane **proton**
conducting fuel cell separator review

IT **Fuel cell** separators

(ceramic-based materials for electrochem. applications)

IT Ceramic membranes

(**proton-conducting**; ceramic-based materials
 for electrochem. applications)

L379 ANSWER 68 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2002:107738 Document No. 136:153925 Hydrogen permeable membrane for
 use in **fuel cells**, and partial reformat
fuel cell system having reforming catalysts in the
 anode **fuel cell** compartment. Smotkin, Eugene S.
 (Nuvant Systems, LLC, USA). PCT Int. Appl. WO 2002011226 A2
 20020207, 58 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ,
 BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ,
 EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
 KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
 MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR,
 TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW; RW: AT, BE, BF, BJ, CF, CG,
 CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML,
 MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2.
 APPLICATION: WO 2001-US20032 20010622. PRIORITY: US 2000-PV222128
 20000731; US 2000-PV244208 20001031.

AB An electronically insulating **proton conductor** is
 adhered or deposited as a film on a dense phase proton permeable
 material in a thickness such that the composite C/D has a
proton conductivity in a preferred intermediate
temperature range of 175-550°. The composite C/D is
 incorporated in a high **temperature electrolyte**

membrane electrolyte assembly (MEA), which is incorporated into a fuel cell that can operate in this intermediate temperature range. The fuel cell in turn is incorporated into a fuel cell system having a fuel reformer in the flow field of a fuel mixture entering the fuel cell or in a mode where the fuel cell receives fuel from an external reformer.

IT 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-32-6, Titanium, uses 7440-62-2, Vanadium, uses 12023-04-0, Feti 12196-72-4 18649-05-3, Cesium Dihydrogen phosphate 153328-13-3D, Strontium yttrium zirconium oxide $\text{SrY}_{0.1}\text{Zr}_{0.9}\text{O}_3$, O-deficient 191980-68-4, Barium calcium niobium oxide $\text{Ba}_3\text{Ca}_{1.18}\text{Nb}_{1.82}\text{O}_{8.73}$ 251566-28-6, Lanthanum magnesium scandium strontium oxide $\text{La}_{0.9}\text{Mg}_{0.1}\text{Sc}_{0.9}\text{Sr}_{0.1}\text{O}_3$ 395656-87-8D, Barium cerium gadolinium zirconium oxide ($\text{BaCe}_{0.5-0.9}\text{Gd}_{0.1}\text{Zr}_{0-0.4}\text{O}_3$), O-deficient 395656-88-9

RL: DEV (Device component use); USES (Uses)
(hydrogen permeable membrane for use in fuel cells and partial reformat fuel cell system having reforming catalysts in anode fuel cell compartment)

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

RN 12023-04-0 HCAPLUS
CN Iron, compd. with titanium (1:1) (8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ti	1	7440-32-6
Fe	1	7439-89-6

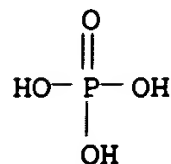
RN 12196-72-4 HCAPLUS
CN Lanthanum, compd. with nickel (1:5) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component
-----------	-------	-----------

		Registry Number
Ni	5	7440-02-0
La	1	7439-91-0

RN 18649-05-3 HCAPLUS

CN Phosphoric acid, monocesium salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 153328-13-3 HCAPLUS

CN Strontium yttrium zirconium oxide (SrY0.1Zr0.9O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0.9	7440-67-7
Y	0.1	7440-65-5
Sr	1	7440-24-6

RN 191980-68-4 HCAPLUS

CN Barium calcium niobium oxide (Ba3Ca1.18Nb1.82O8.73) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	8.73	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

RN 251566-28-6 HCAPLUS

CN Lanthanum magnesium scandium strontium oxide (La0.9Mg0.1Sc0.9Sr0.1O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Sr	0.1	7440-24-6
Sc	0.9	7440-20-2
Mg	0.1	7439-95-4
La	0.9	7439-91-0

RN 395656-87-8 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe0.5-0.9Gd0.1Zr0-0.4O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	3	17778-80-2
Zr	0 - 0.4	7440-67-7

Gd	0.1	7440-54-2
Ce	0.5 - 0.9	7440-45-1
Ba	1	7440-39-3

RN 395656-88-9 HCAPLUS
 CN Vanadium alloy, base, V 66,Cr 34 (9CI) (CA INDEX NAME)

Component	Component Percent	Component Registry Number
V	66	7440-62-2
Cr	34	7440-47-3

IC ICM H01M008-10
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST **fuel cell** hydrogen permeable membrane; reforming
 catalyst anode **fuel cell** compartment
 IT **Electric conductors**
 Fuel cell anodes
 Fuel cell electrolytes
 Fuel cells
 Membranes, nonbiological
 Reforming catalysts
 Synthesis gas manufacturing
 Water gas shift reaction
 (hydrogen permeable membrane for use in **fuel**
 cells and partial reformat **fuel cell**
 system having reforming catalysts in anode **fuel**
 cell compartment)
 IT Polyphosphates
 RL: DEV (Device component use); USES (Uses)
 (hydrogen permeable membrane for use in **fuel**
 cells and partial reformat **fuel cell**
 system having reforming catalysts in anode **fuel**
 cell compartment)
 IT **Hydrides**
 RL: TEM (Technical or engineered material use); USES (Uses)
 (hydrogen permeable membrane for use in **fuel**
 cells and partial reformat **fuel cell**
 system having reforming catalysts in anode **fuel**
 cell compartment)
 IT **Ionic conductors**
 (**protonic**; hydrogen permeable membrane for use in
 fuel cells and partial reformat **fuel**
 cell system having reforming catalysts in anode
 fuel cell compartment)
 IT Fuel gas manufacturing
 (reforming; hydrogen permeable membrane for use in **fuel**
 cells and partial reformat **fuel cell**
 system having reforming catalysts in anode **fuel**
 cell compartment)
 IT **Palladium** alloy, base
 RL: DEV (Device component use); USES (Uses)
 (hydrogen permeable membrane for use in **fuel**
 cells and partial reformat **fuel cell**
 system having reforming catalysts in anode **fuel**
 cell compartment)
 IT 7440-02-0, **Nickel**, uses 7440-05-3,
 Palladium, uses 7440-32-6, **Titanium**,
 uses 7440-62-2, **Vanadium**, uses
 12023-04-0, **Feti** 12196-72-4
 18649-05-3, **Cesium** Dihydrogen phosphate 153328-13-3D
 , **Strontium** yttrium zirconium oxide SrY0.1Zr0.9O3, O-deficient
 191980-68-4, **Barium** calcium niobium oxide
 Ba3Ca1.18Nb1.82O8.73 251566-28-6, **Lanthanum**
 magnesium scandium strontium oxide La0.9Mg0.1Sc0.9Sr0.1O3

395656-87-8D, Barium cerium gadolinium zirconium oxide
(BaCe_{0.5}-0.9Gd_{0.1}Zr₀-0.4O₃), O-deficient 395656-88-9

RL: DEV (Device component use); USES (Uses)
(hydrogen permeable membrane for use in fuel
cells and partial reformat fuel cell
system having reforming catalysts in anode fuel
cell compartment)

IT 1333-74-0P, Hydrogen, uses

RL: IMF (Industrial manufacture); TEM (Technical or engineered
material use); PREP (Preparation); USES (Uses)
(hydrogen permeable membrane for use in fuel
cells and partial reformat fuel cell
system having reforming catalysts in anode fuel
cell compartment)

IT 67-56-1, Methanol, uses

RL: TEM (Technical or engineered material use); USES (Uses)
(hydrogen permeable membrane for use in fuel
cells and partial reformat fuel cell
system having reforming catalysts in anode fuel
cell compartment)

L379 ANSWER 69 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2001:859525 Document No. 136:121015 Approaches and technical
challenges to high temperature operation of proton
exchange membrane fuel cells. Yang, C.;
Costamagna, P.; Srinivasan, S.; Benziger, J.; Bocarsly, A. B.
(Department of Mechanical and Aerospace Engineering, Princeton
University, Princeton, NJ, 08540, USA). Journal of Power Sources,
103(1), 1-9 (English) 2001. CODEN: JPSODZ. ISSN: 0378-7753.
Publisher: Elsevier Science B.V..

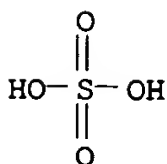
AB Water loss and the coincident increase in membrane resistance to
proton conduction are significant barriers to high
performance operation of traditional proton exchange membrane
fuel cells at elevated temps. where the
relative humidity may be reduced. We report here approaches to the
development of high-temperature membranes for proton exchange
membrane fuel cells; composite perfluorinated
sulfonic acid membranes were prepared to improve water retention, and
nonaq. proton conducting membranes were prepared
to circumvent the loss of water. Exptl. results of composite
membranes of Nafion and zirconium phosphate show
improved operation at elevated temps. Imidazole
impregnated membranes poisoned the electrocatalysts. Cesium
hydrogen sulfate membranes were not able to produce appreciable
current. A brief anal. of temperature requirements for CO
tolerance and a framework for understanding water loss from
fuel cell membranes are presented.

IT 7789-16-4, Cesium hydrogen sulfate

RL: DEV (Device component use); USES (Uses)
(composite membrane containing; approaches and tech. challenges to
high-temperature operation of proton exchange membrane
fuel cells with)

RN 7789-16-4 HCAPLUS

CN Sulfuric acid, monocation salt (8CI, 9CI) (CA INDEX NAME)



● Cs

- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST proton exchange membrane fuel cell operation
 IT **Fuel cells**
 (approaches and tech. challenges to high-temperature
 operation of proton exchange membrane fuel
 cells)
 IT Polyoxyalkylenes, uses
 RL: DEV (Device component use); USES (Uses)
 (fluorine- and sulfo-containing, **ionomers**; approaches and
 tech. challenges to high-temperature operation of proton
 exchange membrane fuel cells with)
 IT Fluoropolymers, uses
 RL: DEV (Device component use); USES (Uses)
 (polyoxyalkylene-, sulfo-containing, **ionomers**; approaches
 and tech. challenges to high-temperature operation of proton
 exchange membrane fuel cells with)
 IT **Ionomers**
 RL: DEV (Device component use); USES (Uses)
 (polyoxyalkylenes, fluorine- and sulfo-containing; approaches and
 tech. challenges to high-temperature operation of proton
 exchange membrane fuel cells with)
 IT 288-32-4, Imidazole, uses 7789-16-4, Cesium hydrogen
 sulfate 13772-29-7, Zirconium hydrogen phosphate
 [Zr(HPO₄)₂] 77950-55-1, Nafion 115
 RL: DEV (Device component use); USES (Uses)
 (composite membrane containing; approaches and tech. challenges to
 high-temperature operation of proton exchange membrane
 fuel cells with)

L379 ANSWER 70 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2001:638121 Porous oxide electrolyte membranes for

fuel cells. Tejedor-Tejedor, M. Isabel; Anderson,
 Marc A. (Environmental Chemistry and Technology Program, University
 of Wisconsin, Madison, WI, 53706, USA). Abstracts of Papers, 222nd
 ACS National Meeting, Chicago, IL, United States, August 26-30,
 2001, COLL-085. American Chemical Society: Washington, D. C.
 (English) 2001. CODEN: 69BUZP.

- AB Background: We fabricate microporous oxide membranes as alternatives
 to organic polymeric **electrolytes** in PEM **fuel**
cells. These materials should operate at much higher
temps. (>150 °C) than organic polymers while still
 retaining water, which helps resolve problems with water management
 and carbon monoxide poisoning. These membranes are cast as thin
 films directly on and then fired to the cathode and anode. This
 intimate contact may alleviate charge transfer limitations at the
 electrode/membrane interface. For future scale-up, membrane
 electrode assemblies that incorporate microporous inorg. membranes
 should be easily fabricated using tape or gel-casting techniques,
 making this process com. viable. Our previous research has shown
 that crack-free inorg. membranes can be deposited on porous nickel
supports. **Proton conductivities** of
 these materials as measured across a micro-porous monolith can reach
 5x10⁻² S/cm at 25 °C and 81% relative humidity, corresponding
 to a specific resistivity of 2x10⁻³ Ω-cm². Currently, these
 membranes are being incorporated in test cells for further
 evaluation at Los Alamos. To date, we have measured **proton**
conductivities of TiO₂ materials at **temps.** to
 15-40 °C and humidities from 33-90%. Gas permeabilities of
 TiO₂ membranes on **supports** have also been measured.
 Preliminary conductivity data on SiO₂ and Al₂O₃ are favorable, but we have
 yet to test mixed oxides. Energies of activation for
conducting protons through TiO₂ depend on the number
 of water mols./nm². Two operating regimes and mechanisms are
 apparent: 1.) Ea decreases with increasing water content and 2.) Ea
 increases with increasing water coverage. The abrupt change in

mechanism at the min. occurs when the pores fill with water. Ea also depends on the **surface** chemical of the pore wall (i.e., degree of protonation and type of **surface** bound species). Therefore, **surface** chemical and pore morphol. (size and shape) should greatly affect **proton conductivity** in TiO₂ membranes.

L379 ANSWER 71 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2001:339933 Document No. 135:112221 Atomistic diffusion mechanism in high **temperature proton conductors**.

Hempelmann, R.; Gross, B. (Physikalische Chemie, Universitat des Saarlandes, Saarbrücken, D-66123, Germany). Schriften des Forschungszentrums Juelich, Reihe Energietechnik/Energy Technology, 15(Pt. 2, High Temperature Materials Chemistry, Part 2), 597-600 (English) 2000. CODEN: SFJTF2. ISSN: 1433-5522. Publisher: Forschungszentrum Juelich GmbH.

AB From the point of view of applied research these materials have attracted attention because of applications as hydrogen sensors and possible applications as **proton conducting electrolytes** in solid oxide **fuel cells** (SOFC). From the point of view of fundamental research these materials exhibit complex proton transport properties and thus represent a challenge both for experimentalists and theoreticians. In the present contribution we will briefly summarize our scientific contributions to the elucidation of the proton diffusion mechanism. We have applied quasielastic neutron scattering and - with the pos. muon as radioactive tracer for the proton - muon spin relaxation. Both these powerful microscopic (atomistic) techniques have not been used before in connection with **proton conducting** oxides. To **support** the novel results obtained in these ways we have performed impedance spectroscopy to measure the **proton conductivity** and ¹⁵N nuclear resonance reaction analyses to investigate the thermodyn. of water vapor absorption.

IT 158634-63-0D, Barium calcium niobium oxide

(Ba₃Ca_{1.18}Nb_{1.82}O₉), oxygen deficient

RL: PRP (Properties)

(water vapor pressure/composition isotherms)

RN 158634-63-0 HCAPLUS

CN Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O₉) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	9	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

CC 65-4 (General Physical Chemistry)

Section cross-reference(s): 76

ST diffusion mechanism high **temp proton conductor**

IT Diffusion

Ionic **conductors**

Muon spin rotation

Neutron scattering

Perovskite-type crystals

(QENS and μ SR studies of diffusion mechanism in high **temperature proton conductors**)

IT Ionic **conductivity**

(**proton**; QENS and μ SR studies of diffusion mechanism in high **temperature proton conductors**)

IT 12408-02-5, Hydrogen ion, properties

RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)

- (QENS and μ SR studies of diffusion mechanism in high temperature proton conductors)
- IT 123082-62-2D, Cerium strontium ytterbium oxide ((Ce,Yb)SrO₃), oxygen deficient 349654-60-0D, Barium ytterbium zirconium oxide (Ba(Yb,Zr)O₃), oxygen deficient 349654-61-1D, Scandium strontium zirconium oxide ((Sc,Zr)SrO₃), oxygen deficient
 RL: PRP (Properties)
 (QENS and μ SR studies of diffusion mechanism in high temperature proton conductors)
- IT 158634-63-0D, Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O₉), oxygen deficient
 RL: PRP (Properties)
 (water vapor pressure/composition isotherms)
- L379 ANSWER 72 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2001:299258 Document No. 134:313632 **Fuel cell**
 electrodes made of polymer electrolyte-catalyst composites, and their manufacture. Hitomi, Shuji (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001118582 A2 20010427, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-297302 19991019.
- AB The electrodes contain cation exchange resins, C particles, and catalyst metals having cores and outer layers. The cores comprise 1-4 metals selected from Pt, Ru, Rh, Pd, and Ir. The outer layers contain Pt, Ru, Rh, Pd, and/or Ir but use the metals different from the cores. The amount of catalyst metals supported on the C particles in contact with H⁺-conducting passages in the resins is >50% of total catalyst metals supported. The electrode manufacturing processes including 2-stage adsorption and reduction of cations, are also described. The electrodes have high resistance to CO catalyst poisoning, activity to oxidation of MeOH, and utilization and alloying ratio of the catalyst metals.
- IT 7440-05-3, **Palladium**, uses
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)
- RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)
- Pd
- IC ICM H01M004-90
 ICS H01M004-88; H01M004-92; H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **fuel cell** electrode polymer electrolyte catalyst composite; **cation** exchange resin **fuel cell** electrode; carbon particle **fuel cell** electrode; **metal** catalyst **fuel cell** electrode
- IT Carbon black, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst support, Vulcan XC 72; **fuel cell** electrodes containing **cation** exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)
- IT Polyoxyalkylenes, uses
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (fluorine- and sulfo-containing, **ionomers**, Nafion; **fuel cell** electrodes containing **cation**

- exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)
- IT **Cation exchangers**
Fuel cell electrodes
 (fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)
- IT **Fluoropolymers, uses**
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (polyoxyalkylene-, sulfo-containing, ionomers, Nafion; fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)
- IT **Ionomers**
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (polyoxyalkylenes, fluorine- and sulfo-containing, Nafion; fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)
- IT 7439-88-5, Iridium, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses
 RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (fuel cell electrodes containing cation exchange resins, C particles, and core-shell catalyst metals, and their manufacture for high catalyst activity)

L379 ANSWER 73 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2001:296206 Document No. 135:79358 Non-stoichiometry, grain boundary transport and chemical stability of **proton conducting** perovskites. Haile, S. M.; Staneff, G.; Ryu, K. H. (Materials Science, California Institute of Technology, Pasadena, CA, 91125, USA). Journal of Materials Science, 36(5), 1149-1160 (English) 2001. CODEN: JMTSAS. ISSN: 0022-2461. Publisher: Kluwer Academic Publishers.

AB The interrelationship between defect chemical, non-stoichiometry, grain boundary transport and chemical stability of **proton conducting** perovskites (doped alkaline earth cerates and zirconates) has been investigated. Non-stoichiometry, defined as the deviation of the A:M molar ratio in AMO₃ from 1:1, dramatically impacts conductivity, sinterability and chemical stability with respect to reaction with CO₂. In particular, alkaline earth deficiency encourages dopant incorporation onto the A-atom site, rather than the intended M-atom site, reducing the concentration of oxygen vacancies. Transport along grain boundaries is, in general, less favorable than transport through the bulk, and thus only in fine-grained materials does microstructure impact the overall elec. properties. The chemical stability of high conductivity cerates is enhanced by the introduction of Zr. The conductivity of BaCe_{0.9-x}Zr_xMO₃ perovskites monotonically decreases with increasing x (increasing Zr content), with the impact of Zr substitution increasing in the order M = Yb → Gd → Nd. Furthermore, the magnitude of the conductivity follows the same sequence for a given zirconium content. This result is interpreted in terms of dopant ion incorporation onto the divalent ion site.

IT 123998-55-0, Barium cerium neodymium zirconium oxide BaCe_{0.8}Nd_{0.1}Zr_{0.1}O₃ 235098-96-1, Barium cerium neodymium zirconium oxide BaCe_{0.7}Nd_{0.1}Zr_{0.2}O₃ 235098-98-3, Barium cerium gadolinium zirconium oxide BaCe_{0.8}Gd_{0.1}Zr_{0.1}O₃ 235099-00-0, Barium cerium gadolinium zirconium oxide BaCe_{0.7}Gd_{0.1}Zr_{0.2}O₃
 RL: PRP (Properties)
 (nonstoichiometry, grain boundary transport and chemical stability

of proton conducting perovskites)

RN 123998-55-0 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe_{0.8}Nd_{0.1}Zr_{0.1}O₃) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-96-1 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe_{0.7}Nd_{0.1}Zr_{0.2}O₃) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.2	7440-67-7
Ce	0.7	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-98-3 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.8}Gd_{0.1}Zr_{0.1}O₃) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.1	7440-67-7
Gd	0.1	7440-54-2
Ce	0.8	7440-45-1
Ba	1	7440-39-3

RN 235099-00-0 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.7}Gd_{0.1}Zr_{0.2}O₃) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.2	7440-67-7
Gd	0.1	7440-54-2
Ce	0.7	7440-45-1
Ba	1	7440-39-3

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72, 76

ST **fuel cell electrolyte proton
conducting perovskite; grain boundary transport
proton conducting perovskite**

IT Electric conductivity
Electrolytes

Fuel cell electrolytes

Grain boundaries

Nonstoichiometry

Perovskite-type crystals

(nonstoichiometry, grain boundary transport and chemical stability
of proton conducting perovskites)

IT 12009-21-1, barium zirconium oxide bazro3 12036-39-4, strontium zirconium oxide srzro3 12267-77-5, barium cerium oxide baceo3 12267-97-9, cerium strontium oxide cesro3 112235-03-7, Barium cerium neodymium oxide BaCe0.9Nd0.1O3 123998-55-0, Barium cerium neodymium zirconium oxide BaCe0.8Nd0.1Zr0.1O3 136575-37-6, Barium cerium ytterbium oxide BaCe0.9Yb0.1O3 136575-38-7, Barium cerium gadolinium oxide BaCe0.9Gd0.1O3 235098-96-1, Barium cerium neodymium zirconium oxide BaCe0.7Nd0.1Zr0.2O3 235098-98-3, Barium cerium gadolinium zirconium oxide BaCe0.8Gd0.1Zr0.1O3 235099-00-0, Barium cerium gadolinium zirconium oxide BaCe0.7Gd0.1Zr0.2O3 347886-57-1, Barium cerium ytterbium zirconium oxide (BaCe0.8Yb0.1Zr0.1O3) 347886-58-2, Barium cerium ytterbium zirconium oxide (BaCe0.7Yb0.1Zr0.2O3)
 RL: PRP (Properties)
 (nonstoichiometry, grain boundary transport and chemical stability of proton conducting perovskites)

L379 ANSWER 74 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2001:200192 Microporous oxides as **electrolytes** in proton exchange membrane **fuel cells**. Anderson, Marc A.; Tejedor, M. Isabel (Water Chemistry Program, University of Wisconsin, Madison, WI, 53706, USA). Abstracts of Papers, 221st ACS National Meeting, San Diego, CA, United States, April 1-5, 2001 ENVR-137 (English) 2001. CODEN: 69FZD4. Publisher: American Chemical Society.

AB We have been investigating the phys. and electrochem. characteristics of inorg. membrane materials composed of microporous SiO2, TiO2 and Al2O3. All of these materials have high **surface** areas and high porosity. The Al2O3 membranes materials can be described as having slit-like pores of width less than 20 angstroms. SiO2 and TiO2 membrane materials contain randomly packed spherical nanoparticles and pore size in the **mesoporous** region. Our calcns. indicate that for our oxide samples equilibrated under conditions of 81% relative humidity and at 25°C the number of water mols. contained as expressed in mmols/cm3 are 20, 26 and 25 for SiO2, TiO2 and Al2O3 resp. Measured **proton conductivities** of all three oxides increase with increasing relative humidity, SiO2 and TiO2 increasing over 3 orders of magnitude between RH values of 33% and 97%. We also find that, at 81% RH, conductivities generally increase with increasing **temperature** with SiO2 increasing linearly but TiO2 and Al2O3 exponentially. Activation energies for our materials are 15.8, 17.0 and 17.1 kJ.Mol-1 for SiO2, TiO2, and Al2O3 resp. While our best values for the conductivities of our inorg. electrolytes are still about a factor of two less than an organic polymer membrane such as Nafion (5 x10-3 cm-1 vs at 80°C vs. 1.3 x 10-2 cm-1 at 79°C), it should be noted that we are comparing absolute values for the conductivity. In practice, these ceramic membranes would be cast onto porous conducting **supports** with thicknesses less than 0.5 µ. Nafion membranes are typically around 200µm thick. This means that we should be capable of greatly reducing the actual resistance of these membrane electrolytes, and this, along with higher possible operating **temps.** should prove to make these systems com. competitive.

L379 ANSWER 75 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2001:20006 Document No. 134:165585 Complex impedance studies of **proton-conducting** membranes. Edmondson, C. A.; Stallworth, P. E.; Chapman, M. E.; Fontanella, J. J.; Wintersgill, M. C.; Chung, S. H.; Greenbaum, S. G. (Physics Department, U.S. Naval Academy, Annapolis, MD, 21402-5026, USA). Solid State Ionics, 135(1-4), 419-423 (English) 2000. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Complex impedance studies have been carried out on Dow 800, Dow 1000 and Nafion 117 membranes at various water contents and a variety of **temps.** and hydrostatic pressures. At room **temperature**

- and pressure the usual gradual decrease in elec. conductivity with decreasing water content is observed. For very low water content materials the variation of the conductivity with pressure from 0 to 0.2 GPa (2 kbar) is large and gives rise to apparent activation vols., ΔV , as large as 54 cm³/mol. In addition, for low water content materials, there is a tendency for smaller equivalent **wts.** (same **side** chains) or larger **side** chains to have larger activation vols. At high water content, ΔV is relatively independent of the host polymer and neg. values are observed at the highest water contents. These results provide **support** for the model where proton transport in high water content sulfonated fluorocarbons is similar to that for liquid water. All results are explained qual. via free volume. Ambient-pressure, variable-temperature 2HT1 and linewidth measurements imply a heterogeneous environment of the water mols. Proton pulsed field gradient NMR studies in saturated Dow membranes verify the expectation that ionic conductivity is determined primarily by diffusion of water mols.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 36
- ST fuel cell **proton conducting** membrane impedance
- IT Electric conductivity
 Fuel cell electrolytes
 Fuel cells
 Membranes, nonbiological
 (complex impedance studies of **proton-conducting** membranes)
- IT Polyoxyalkylenes, properties
RL: PRP (Properties)
 (fluorine- and sulfo-containing, ionomers; complex impedance studies of **proton-conducting** membranes)
- IT Fluoropolymers, properties
RL: PRP (Properties)
 (polyoxyalkylene-, sulfo-containing, ionomers; complex impedance studies of **proton-conducting** membranes)
- IT Ionomers
RL: PRP (Properties)
 (polyoxyalkylenes, fluorine- and sulfo-containing; complex impedance studies of **proton-conducting** membranes)
- IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
 (sulfonated; complex impedance studies of **proton-conducting** membranes)
- IT 66796-30-3, Nafion 117 163515-65-9, Dow 800 324749-88-4, Dow 1000
RL: PRP (Properties)
 (complex impedance studies of **proton-conducting** membranes)
- L379 ANSWER 76 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2000:773924 Document No. 133:337259 Two-phase perovskite ionic and electric **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing. Wachsman, Eric D.; Jiang, Naixiong (Her Majesty In Right of Canada as Represented by the Minister of Natural Resources, Can.). Eur. Pat. Appl. EP 1048614 A1 20001102, 11 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2000-303635 20000428. PRIORITY: US 1999-302786 19990430.
- AB A two-phase ionic **conductor** which exhibits both hydrogen ion conductivity and elec. conductivity consists of (1) a perovskite-type oxide of general formula ABO₃, in which A is an element selected from Ba, Ca, Mg, and Sr, B is Ce_{1-x}M_x or Zr_{1-x}M_x (M is a selected from Y, Yb, In, Gd, Nd, Eu, Sm, and Tb), and x = 0-1; and (2) an elec. **conductor** comprising palladium. The palladium may be coated on particles of the oxide in the form of an oxide powder. These ionic **conductors** can act as ionic membranes for H₂ sepns.

in reforming of light hydrocarbons to synthesis gas and for H2 manufacture from natural gas or C>1-hydrocarbons.

IT 7440-05-3, Palladium, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (perovskite membranes containing; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
 RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IT 131960-38-8P, Strontium yttrium zirconium oxide (SrY0.05Zr0.95O3) 304016-28-2P, Strontium yttrium zirconium oxide (SrY0.04Zr0.96O3)
 RL: NUU (Other use, unclassified); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 (perovskite, membranes containing; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
 RN 131960-38-8 HCAPLUS
 CN Strontium yttrium zirconium oxide (SrY0.05Zr0.95O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

RN 304016-28-2 HCAPLUS
 CN Strontium yttrium zirconium oxide (SrY0.04Zr0.96O3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.96	7440-67-7
Y	0.04	7440-65-5
Sr	1	7440-24-6

IC ICM C01B003-50
 ICS B01D053-22; B01D071-02; C01G025-00; C01F017-00; H01M008-06
 CC 49-1 (Industrial Inorganic Chemicals)
 Section cross-reference(s): 51, 52, 57
 ST perovskite **ionic** elec cond membrane; hydrogen permeation perovskite membrane; palladium perovskite hydrogen sepn membrane; natural gas hydrogen sepn membrane; synthesis gas hydrogen sepn membrane; **fuel cell** hydrogen sepn membrane
 IT Perovskite-type crystals
 (membranes containing; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
 IT **Fuel cells**
 (membranes, hydrogen manufacture with; two-phase perovskite **ionic** and elec. **conductors** as hydrogen separation membranes in hydrogen recovery from synthesis gas and hydrocarbon processing)
 IT **Electric conductors**
 (perovskite membranes; two-phase perovskite ionic and elec. **conductors** as hydrogen separation membranes in hydrogen

- recovery from synthesis gas and hydrocarbon processing)
- IT Natural gas, reactions
 RL: PEP (Physical, engineering or chemical process); RCT (Reactant);
 PROC (Process); RACT (Reactant or reagent)
 (processing, hydrogen manufacture from; two-phase perovskite ionic and
 elec. **conductors** as hydrogen separation membranes in
 hydrogen recovery from synthesis gas and hydrocarbon processing)
- IT Ionic **conductors**
 (proton, perovskite membranes; two-phase perovskite
 ionic and elec. **conductors** as hydrogen separation membranes
 in hydrogen recovery from synthesis gas and hydrocarbon
 processing)
- IT Synthesis gas manufacturing
 (reforming synthesis gas manufacturing, hydrogen manufacture by; two-phase
 perovskite ionic and elec. **conductors** as hydrogen separation
 membranes in hydrogen recovery from synthesis gas and hydrocarbon
 processing)
- IT 7440-05-3, Palladium, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (perovskite membranes containing; two-phase perovskite ionic and
 elec. **conductors** as hydrogen separation membranes in
 hydrogen recovery from synthesis gas and hydrocarbon processing)
- IT 110687-91-7P, Cerium strontium yttrium oxide (Ce_{0.95}SrYb_{0.05}O₃)
 112235-02-6P, Barium cerium neodymium oxide (BaCe_{0.95}Nd_{0.05}O₃)
 112235-03-7P, Barium cerium neodymium oxide (BaCe_{0.9}Nd_{0.1}O₃)
 113876-58-7P, Barium cerium yttrium oxide (BaCe_{0.90}Y_{0.10}O₃)
 131960-38-8P, Strontium yttrium zirconium oxide
 (SrY_{0.05}Zr_{0.95}O₃) 136575-37-6P, Barium cerium yttrium oxide
 (BaCe_{0.9}Yb_{0.1}O₃) 136575-39-8P, Barium cerium yttrium oxide
 (BaCe_{0.95}Y_{0.05}O₃) 137806-35-0P, Calcium indium zirconium oxide
 (CaIn_{0.04}Zr_{0.96}O₃) 140883-59-6P, Strontium yttrium zirconium
 oxide (SrYb_{0.05}Zr_{0.95}O₃) 142107-79-7P, Calcium indium zirconium
 oxide (CaIn_{0.1}Zr_{0.9}O₃) 143312-53-2P, Barium cerium yttrium oxide
 (BaCe_{0.8}Y_{0.2}O₃) 144049-10-5P, Barium cerium gadolinium oxide
 (BaCe_{0.85}Gd_{0.15}O₃) 144378-46-1P, Barium cerium gadolinium oxide
 (BaCe_{0.8}Gd_{0.2}O₃) 148972-97-8P, Barium cerium samarium oxide
 (BaCe_{0.8}Sm_{0.2}O₃) 150232-28-3P, Barium yttrium zirconium oxide
 (BaY_{0.05}Zr_{0.95}O₃) 150232-31-8P, Calcium indium zirconium oxide
 (CaIn_{0.05}Zr_{0.95}O₃) 184022-90-0P, Barium cerium europium oxide
 (BaCe_{0.85}Eu_{0.15}O₃) 304016-22-6P, Barium cerium terbium oxide
 (BaCe_{0.85}Tb_{0.15}O₃) 304016-28-2P, Strontium yttrium
 zirconium oxide (SrY_{0.04}Zr_{0.96}O₃)
 RL: NUU (Other use, unclassified); PRP (Properties); SPN (Synthetic
 preparation); PREP (Preparation); USES (Uses)
 (perovskite, membranes containing; two-phase perovskite ionic and
 elec. **conductors** as hydrogen separation membranes in
 hydrogen recovery from synthesis gas and hydrocarbon processing)
- IT 1333-74-0P, Hydrogen, preparation
 RL: IMF (Industrial manufacture); PREP (Preparation)
 (recovery of; two-phase perovskite ionic and elec.
conductors as hydrogen separation membranes in hydrogen
 recovery from synthesis gas and hydrocarbon processing)
- IT 74-82-8, Methane, reactions
 RL: PEP (Physical, engineering or chemical process); RCT (Reactant);
 PROC (Process); RACT (Reactant or reagent)
 (reforming of; two-phase perovskite ionic and elec.
conductors as hydrogen separation membranes in hydrogen
 recovery from synthesis gas and hydrocarbon processing)

L379 ANSWER 77 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2000:721148 Document No. 133:364386 Polymer solid acid composite
 membranes for fuel-cell applications. Boysen,
 Dane A.; Chisholm, Calum R. I.; Haile, Sossina M.; Narayanan,
 Sekharipuram R. (Department of Materials Science, California
 Institute of Technology, Pasadena, CA, 91125, USA). Journal of the
 Electrochemical Society, 147(10), 3610-3613 (English) 2000. CODEN:

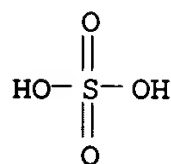
JESOAN. ISSN: 0013-4651. Publisher: Electrochemical Society.

AB A systematic study of the conductivity of polyvinylidene fluoride (PVDF) and CsHSO₄ composites, containing 0 to 100% CsHSO₄, has been carried out. The polymer, with its good mech. properties, served as a supporting matrix for the high proton cond . inorg. phase. The conductivity of composites exhibited a sharp increase with temperature at 142°C, characteristic of the superprotonic phase transition of CsHSO₄. At high temperature (160°C), the dependence of conductivity on vol % CsHSO₄ was monotonic and revealed a percolation threshold of .apprx.10 volume%. At low temperature (100°C), a maximum in the conductivity at .apprx.80 vol % CsHSO₄ was observed. Results of preliminary fuel cell measurements are presented.

IT 7789-16-4, Cesium hydrogen sulfate
 RL: DEV (Device component use); USES (Uses)
 (polymer solid acid composite membranes for fuel-cell applications)

RN 7789-16-4 HCAPLUS

CN Sulfuric acid, monocation salt (8CI, 9CI) (CA INDEX NAME)



● Cs

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 38, 72, 76

ST polyvinylidene fluoride cesium hydrogen sulfate electrolyte
 ; fuel cell solid electrolyte

IT Fuel cell electrolytes
 Ionic conductivity
 Structural phase transition
 (polymer solid acid composite membranes for fuel-cell applications)

IT Fluoropolymers, uses
 RL: DEV (Device component use); USES (Uses)
 (polymer solid acid composite membranes for fuel-cell applications)

IT 7789-16-4, Cesium hydrogen sulfate 24937-79-9,
 Polyvinylidene fluoride
 RL: DEV (Device component use); USES (Uses)
 (polymer solid acid composite membranes for fuel-cell applications)

L379 ANSWER 78 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2000:535394 Document No. 133:137861 Proton
 conducting membrane using a solid acid for fuel
 cells. Haile, Sossina M.; Boysen, Dane; Narayanan,
 Sekharipuram R.; Chisholm, Calum (California Institute of
 Technology, USA). PCT Int. Appl. WO 2000045447 A2 20000803, 61 pp.
 DESIGNATED STATES: W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY,
 CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM,
 HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT,
 LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE,
 SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW,
 AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH,
 CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR,
 NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2.
 APPLICATION: WO 2000-US1783 20000121. PRIORITY: US 1999-PV116741

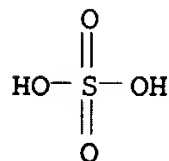
19990122; US 1999-PV146946 19990802; US 1999-PV146943 19990802; US 1999-PV151811 19990830; US 1999-439377 19991115.

AB A solid acid material is used as a **proton conducting** membrane in an electrochem. device. The solid acid material can be one of a plurality of different kinds of materials. A binder can be added, and that binder can be either a nonconducting or a conducting binder. Nonconducting binders can be, for example, a polymer or a glass. A conducting binder enables the device to be both **proton conducting** and electron conducting.

IT 7789-16-4, Cesium hydrogen sulfate cshso4 10294-60-7
 , Ammonium hydrogen selenate 18649-05-3, Cesium dihydrogen phosphate 63317-98-6 89190-25-0
 161882-09-3 286382-81-8
 RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
 (proton conducting membrane using solid acid for fuel cells)

RN 7789-16-4 HCAPLUS

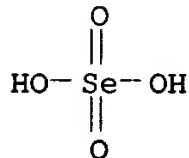
CN Sulfuric acid, monocation salt (8CI, 9CI) (CA INDEX NAME)



● Cs

RN 10294-60-7 HCAPLUS

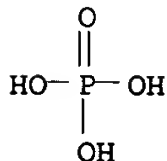
CN Selenic acid, monoammonium salt (9CI) (CA INDEX NAME)



● NH₃

RN 18649-05-3 HCAPLUS

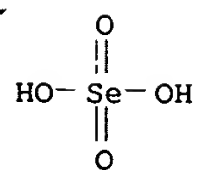
CN Phosphoric acid, monocation salt (8CI, 9CI) (CA INDEX NAME)



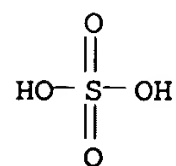
● Cs

RN 63317-98-6 HCAPLUS

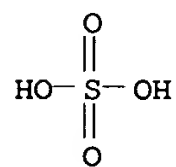
CN Selenic acid, ammonium salt (2:3) (9CI) (CA INDEX NAME)

●_{3/2} NH₃

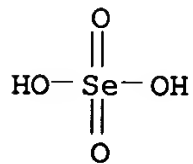
RN 89190-25-0 HCAPLUS
CN Sulfuric acid, cesium salt (2:3) (9CI) (CA INDEX NAME)

●_{3/2} Cs

RN 161882-09-3 HCAPLUS
CN Sulfuric acid, cesium salt (4:5), hydrate (9CI) (CA INDEX NAME)

●_{5/4} Cs●_x H₂O

RN 286382-81-8 HCAPLUS
CN Selenic acid, ammonium salt (4:5), hydrate (9CI) (CA INDEX NAME)

●_{5/4} NH₃●_x H₂O

ICI H01
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72, 76
 ST **fuel cell proton conducting**
 membrane solid acid
 IT Conducting polymers
 Electric conductors
 Electric insulators
 Semiconductor materials
 (binder; **proton conducting** membrane using
 solid acid for **fuel cells**)
 IT Fluoropolymers, uses
 Glass, uses
Metals, uses
 Polyesters, uses
 Polymers, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (binder; **proton conducting** membrane using
 solid acid for **fuel cells**)
 IT Sintering
 (hot pressing; **proton conducting** membrane
 using solid acid for **fuel cells**)
 IT Polyketones
 Polyketones
 RL: TEM (Technical or engineered material use); USES (Uses)
 (polyether-; **proton conducting** membrane using
 solid acid for **fuel cells**)
 IT Polyethers, uses
 Polyethers, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (polyketone-; **proton conducting** membrane
 using solid acid for **fuel cells**)
 IT Battery electrolytes
 Ceramics
Electrolytic cells
Fuel cell electrolytes
Fuel cells
 (**proton conducting** membrane using solid acid
 for **fuel cells**)
 IT Fluoropolymers, uses
 Phosphates, uses
 Polyanilines
 Polysiloxanes, uses
 Selenates
 Silicates, uses
 Sulfates, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (**proton conducting** membrane using solid acid
 for **fuel cells**)
 IT Capacitors
 (supercapacitor; **proton conducting** membrane
 using solid acid for **fuel cells**)
 IT 7440-21-3, Silicon, uses 24937-79-9, PvdF
 RL: TEM (Technical or engineered material use); USES (Uses)
 (binder; **proton conducting** membrane using
 solid acid for **fuel cells**)
 IT 7782-42-5, Graphite, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (paper; **proton conducting** membrane using
 solid acid for **fuel cells**)
 IT 7722-76-1, Ammonium dihydrogen phosphate 7789-16-4, Cesium
 hydrogen sulfate cshso4 7803-63-6, Ammonium hydrogen sulfate
 10294-60-7, Ammonium hydrogen selenate 12593-60-1,
 Ammonium phosphate sulfate ((NH4)2(H2PO4)(HSO4)) 13453-45-7,
 Thallium hydrogen sulfate tlhso4 13774-16-8, Rubidium dihydrogen

phosphate 13775-30-9 13778-50-2, Sodium silicate Na_3HSiO_4
 13780-02-4 15457-97-3, Sodium silicate ($\text{Na}_2\text{H}_2\text{SiO}_4$) 15587-72-1,
 Rubidium hydrogen sulfate 16331-85-4 18649-05-3, Cesium
 dihydrogen phosphate 20583-58-8, Sulfuric acid, rubidium
salt (2:3) 22112-04-5 39473-99-9, Rubidium phosphate
 selenate ($\text{Rb}_2(\text{H}_2\text{PO}_4)(\text{HSeO}_4)$) 41469-37-8, Sodium silicate NaH_3SiO_4
 63317-98-6 63737-07-5, Cesium hydrogen selenate cshseo_4
 68875-27-4, Rubidium hydrogen selenate 71555-62-9 88937-51-3
 89190-25-0 99489-71-1, Ammonium arsenate sulfate
 ($(\text{NH}_4)_2(\text{H}_2\text{AsO}_4)(\text{HSO}_4)$) 99543-07-4, Selenic acid, cesium
salt (2:3) 101811-97-6, Potassium silicate KH_3SiO_4
 135498-03-2 135710-63-3 157612-88-9 161430-99-5, Tellurium
 oxide teo_4 161882-09-3 165901-90-6, Cesium phosphate
 sulfate ($\text{Cs}_3(\text{H}_2\text{PO}_4)(\text{HSO}_4)_2$) 183953-14-2, Silicic acid (H_4SiO_4),
 tripotassium **salt** 183953-17-5, Silicic acid (H_4SiO_4),
 dipotassium **salt** 213411-40-6, Cesium phosphate sulfate
 ($\text{Cs}_3(\text{H}_2\text{PO}_4)_0.5(\text{HSO}_4)_2.5$) 218931-29-4, Cesium phosphate sulfate
 ($\text{Cs}_5(\text{H}_2\text{PO}_4)_2(\text{HSO}_4)_3$) 220078-67-1, Cesium phosphate selenate
 ($\text{Cs}_3(\text{H}_2\text{PO}_4)(\text{HSeO}_4)_2$) 220078-71-7, Cesium phosphate selenate
 ($\text{Cs}_5(\text{H}_2\text{PO}_4)_2(\text{HSeO}_4)_3$) 231277-45-5, Cesium phosphate sulfate
 ($\text{Cs}_2(\text{H}_2\text{PO}_4)(\text{HSO}_4)$) 233277-01-5, Ammonium phosphate selenate
 ($(\text{NH}_4)_2(\text{H}_2\text{PO}_4)(\text{HSeO}_4)$) 260429-55-8, Rubidium phosphate sulfate
 ($\text{Rb}_2(\text{H}_2\text{PO}_4)(\text{HSO}_4)$) 286382-74-9, Cesium phosphate selenate
 ($\text{Cs}_2(\text{H}_2\text{PO}_4)(\text{HSeO}_4)$) 286382-75-0 286382-77-2 286382-78-3
 286382-79-4, Cesium phosphate selenate ($\text{Cs}_3(\text{H}_2\text{PO}_4)_0.5(\text{HSeO}_4)_2.5$)
 286382-81-8 286382-82-9 286382-83-0 286382-84-1
 286382-85-2 286382-86-3 286382-87-4 286382-88-5 286382-89-6
 286382-90-9

RL: DEV (Device component use); TEM (Technical or engineered
 material use); USES (Uses)

(proton conducting membrane using solid acid
 for fuel cells)

IT 1302-88-1, Cordierite 1309-48-4, Magnesia, uses 1344-28-1,
 Alumina, uses 7429-90-5, Aluminum, uses 7439-89-6, Iron, uses
 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-50-8,
 Copper, uses 7440-57-5, Gold, uses 7440-66-6, Zinc, uses
 7631-86-9, Silica, uses 9002-84-0, Ptfе 25038-78-2,
 Poly(dicyclopentadiene) 25233-30-1, Polyaniline 25667-42-9
 30604-81-0, Polypyrrole 31900-57-9, Polydimethyl siloxane

RL: TEM (Technical or engineered material use); USES (Uses)

(proton conducting membrane using solid acid
 for fuel cells)

IT 1333-74-0P, Hydrogen, preparation

RL: PUR (Purification or recovery); PREP (Preparation)

(separator; proton conducting membrane using
 solid acid for fuel cells)

L379 ANSWER 79 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

2000:143468 Document No. 132:168778 Substrate supported

catalyst layers for polymer electrolyte fuel

cell electrodes, inks and method for manufacture the

catalyst layer, gas diffusion electrodes, catalyst membrane

assembly, and electrode membrane assembly. Zuber, Ralf; Kalhi,

Ralf; Knut, FehI; Starz, Karl-Anton (Degussa-Huls A.-G., Germany).

Jpn. Kokai Tokkyo Koho JP 2000067873 A2 20000303, 9 pp. (Japanese).

CODEN: JKXXAF. APPLICATION: JP 1999-232591 19990819. PRIORITY: DE

1998-19837669 19980820.

AB The catalyst layers contain a H^+ conductive

ionomer and noble metal laded conductive carbonaceous

particles, and are prepared from an ink containing the ionomer, the

carbonaceous particles, and a 0 valence noble metal

complex by applying the ink on a substrate and decomposing the complex

at a temperature that does cause damage to the substrate. The

gas diffusion electrodes have the catalyst layer on a gas diffusing

substrate, the catalyst membrane assembly has the catalyst layer on

both side of a polymer electrolyte membrane, and the

electrode membrane assembly has gas diffusion structures on both sides of the catalyst membrane assembly.

IC ICM H01M004-86
ICS H01M004-88; H01M004-90; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST polymer electrolyte fuel cell
electrode catalyst

IT Carbon black, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluorine- and sulfo-containing, ionomers; electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluorine-containing, sulfo-containing, ionomers; electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Fuel cell electrodes
(in manufacture of electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Fluoropolymers, uses
Fluoropolymers, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylene-, sulfo-containing, ionomers; electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT Ionomers
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing; electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT 7440-06-4, Platinum, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

IT 2627-95-4DP, 1,3-Divinyl-1,1,3,3-tetramethyldisiloxane, reaction products with platinum 48018-87-7DP, reaction products with 1,3-divinyl-1,1,3,3-tetramethyl disiloxane
RL: IMF (Industrial manufacture); NUU (Other use, unclassified); PREP (Preparation); USES (Uses)
(in manufacture of electrode catalyst layers containing noble metal laden carbonaceous materials and ionomers for polymer electrolyte fuel cells)

L379 ANSWER 80 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
2000:116981 Document No. 132:174949 Inorganic hydrogen and hydrogen polymer compounds and applications thereof. Mills, Randell L. (USA). PCT Int. Appl. WO 2000007931 A2 20000217, 385 pp.
DESIGNATED STATES: W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY,

CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1999-US17129 19990729. PRIORITY: US 1998-95149 19980803; US 1998-101651 19980924; US 1998-105752 19981026; US 1998-113713 19981224; US 1999-123835 19990311; US 1999-130491 19990422; US 1999-141036 19990629.

AB Compds. are provided comprising at least one neutral, pos., or neg. hydrogen species having a binding energy greater than its corresponding ordinary hydrogen species, or greater than any hydrogen species for which the corresponding ordinary hydrogen species is unstable or is not observed. Compds. comprise at least one increased binding energy hydrogen species and at least one other atom, mol., or ion other than an increased binding energy hydrogen species. One group of such compds. contains one or more increased binding energy hydrogen species selected from the group consisting of H_n , H_n^- , and H_n^+ , where n is a pos. integer, with the proviso that $n > 1$ when H has a pos. charge. Another group of such compds. may have the formula $[MH_mM'X]_n$ wherein m and n are each an integer, M and M' are each an alkali or alkaline earth cation, X is a singly or doubly neg. charged anion, and the hydrogen content H_m of the compound comprises at least one increased binding energy hydrogen species. Methods of forming the compds. and numerous applications are disclosed. A method for forming the compds. comprises reacting gaseous hydrogen atoms with a gaseous metal catalyst (list of metals provided) and reaction of the formed hydrino atoms with at least one selected from the group of a source of electrons (H^+ , increased binding energy hydrogen species, other element). A method for extracting energy from H atoms further comprises the step of applying an adjustable elec. or magnetic field to control the rate of energy release. Thus, potassium iodo **hydride** (KHI) comprising high binding energy **hydride ions** (hydrino **hydrides**) are prepared by reaction of atomic hydrogen with potassium iodide in the presence of potassium metal catalyst in a stainless steel gas cell (apparatus diagrams provided). The blue crystals were characterized by a number of methods (ToF-SIMS, XPS, 1H and 39K MAS NMR, FTIR, Electrospray-Ionization-Time-of-Flight Mass Spectroscopy, LC/MS, elemental anal., thermal decomposition). The compound contains two forms of **hydride ion**; thermal decomposition with mass spectral anal. indicates at least $H^{-(1/2)}$ is present in KHI which may be responsible for the blue color. The objective of the invention is to provide compds. that can be used in a wide variety of applications, e.g., batteries, **fuel cells**, cutting materials, light-weight high-strength materials and synthetic fibers, corrosion or heat-resistant **coatings**, xerog. compds., proton source, photoluminescent compds., phosphors for lighting, UV and visible light source, photoconductors, photovoltaics, chemiluminescent or fluorescent compds., optical **coatings** or filters, extreme UV laser media, fiber optic cables, magnets and magnetic computer storage media, superconductors, etching agents, masking agents, agents to purify silicon, dopants in semiconductor fabrication, cathodes for thermoionic generators, fuels, explosives, and propellants. Claimed uses of the present invention include separation of isotopes, a proton source, xerog. toner, use in a magnet or magnetic computer memory storage material, or as an etching agent. Time-of-flight secondary ion mass spectral data (ToF-SIMS) are listed for a wide variety of hydrino **hydride** compds. or their fragments.

IT 7439-89-6, Iron, uses 7440-02-0,
Nickel, uses 7440-05-3, Palladium, uses
7440-32-6, Titanium, uses 7440-47-3,

Chromium, uses 7440-50-8, Copper, uses
7440-62-2, Vanadium, uses

RL: CAT (Catalyst use); USES (Uses)

(catalyst for preparation of hydrino-containing inorg. hydrogen or
hydrogen polymer compds.)

RN 7439-89-6 HCAPLUS

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-32-6 HCAPLUS

CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCAPLUS

CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

RN 7440-62-2 HCAPLUS

CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM C01B006-00

CC 78-5 (Inorganic Chemicals and Reactions)

Section cross-reference(s): 50, 52, 67, 71, 76, 79

ST hydrino **hydride** inorg compd prepn; hydrogen hydrino

polymer inorg compd prepn; alkali **metal** hydrino

hydride prepn; **metal** catalyst hydrino

hydride prepn; binding energy hydrino **hydride**;

etching agent hydrino **hydride** compd; isotope sepn hydrino

hydride compd; magnet memory storage hydrino **hydride**
compd

IT Catalysts

(gaseous **metals** as catalysts in preparation of

- hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
- IT Transition **metals**, uses
 RL: CAT (Catalyst use); USES (Uses)
 (gaseous transition **metals** as catalysts for preparation of
 hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
- IT Alkaline earth compounds
 RL: ARU (Analytical role, unclassified); NUU (Other use,
 unclassified); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); ANST (Analytical study); PREP
 (Preparation); USES (Uses)
 (**hydrides**; preparation and uses of hydrino-containing alkaline earth
hydrides)
- IT Alkali **metal hydrides**
 RL: ARU (Analytical role, unclassified); NUU (Other use,
 unclassified); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); ANST (Analytical study); PREP
 (Preparation); USES (Uses)
 (preparation and uses of hydrino-containing alkali **metal**
hydrides)
- IT **Hydrides**
 RL: ARU (Analytical role, unclassified); NUU (Other use,
 unclassified); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); ANST (Analytical study); PREP
 (Preparation); USES (Uses)
 (preparation and uses of hydrino-containing inorg. hydrogen or hydrogen
 polymer compds.)
- IT Transition **metal hydrides**
 RL: ARU (Analytical role, unclassified); NUU (Other use,
 unclassified); SPN (Synthetic preparation); TEM (Technical or
 engineered material use); ANST (Analytical study); PREP
 (Preparation); USES (Uses)
 (preparation and uses of **metal** hydrino-containing inorg.
 hydrogen or hydrogen polymer compds.)
- IT 7429-91-6, Dysprosium, uses 7439-89-6, **Iron**,
 uses 7439-90-9, Krypton, uses 7439-92-1, Lead, uses 7439-93-2,
 Lithium, uses 7439-96-5, Manganese, uses 7439-98-7, Molybdenum,
 uses 7440-02-0, **Nickel**, uses 7440-03-1,
 Niobium, uses 7440-05-3, **Palladium**, uses
 7440-06-4, Platinum, uses 7440-10-0, Praseodymium, uses
 7440-17-7, Rubidium, uses 7440-19-9, Samarium, uses 7440-24-6,
 Strontium, uses 7440-31-5, Tin, uses 7440-32-6,
Titanium, uses 7440-38-2, Arsenic, uses 7440-41-7,
 Beryllium, uses 7440-45-1, Cerium, uses 7440-46-2, Cesium, uses
 7440-47-3, **Chromium**, uses 7440-48-4, Cobalt,
 uses 7440-50-8, **Copper**, uses 7440-54-2,
 Gadolinium, uses 7440-62-2, **Vanadium**, uses
 7440-66-6, Zinc, uses 7440-70-2, Calcium, uses 7782-49-2,
 Selenium, uses 13494-80-9, Tellurium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst for preparation of hydrino-containing inorg. hydrogen or
 hydrogen polymer compds.)
- IT 7440-09-7, Potassium, uses
 RL: CAT (Catalyst use); USES (Uses)
 (catalyst for preparation of inorg. **hydrides** and hydrogen
 polymer compds. containing hydrino **hydrides**)
- IT 7681-11-0, Potassium iodide, reactions 12385-13-6, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (for preparation of inorg. **hydrides** and hydrogen polymer
 compds. containing hydrino **hydrides**)
- IT 50808-20-3DP, Silicon **hydride**, inorg. hydrino-containing
 compound with hydrogen polymer 169217-93-0DP, Hydrogen, mol. (H16),
 inorg. hydrino-containing compound, preparation 169217-94-1DP, Hydrogen,
 mol. (H24), inorg. hydrino-containing compound, preparation
 179466-41-2DP, Hydrogen, mol. (H10), inorg. hydrino-containing compound,
 preparation 258858-25-2P, Potassium carbonate **hydride**
 hydroxide 258880-05-6DP, Hydrogen, ion (H161-), inorg.

- hydrino-containing compound, preparation 258880-32-9DP, Hydrogen, mol. (H60), inorg. hydrino-containing compound, preparation 258880-33-0DP, Hydrogen, mol. (H70), inorg. hydrino-containing compound, preparation
 RL: ARU (Analytical role, unclassified); NUU (Other use, unclassified); SPN (Synthetic preparation); TEM (Technical or engineered material use); ANST (Analytical study); PREP (Preparation); USES (Uses)
 (preparation and uses of hydrino-containing inorg. hydrogen or hydrogen polymer compds.)
- IT 258858-22-9P, Potassium carbonate **hydride** 258858-23-0P, Potassium **hydride** nitrate ($K_2H(NO_3)$) 258858-24-1P, Potassium **hydride** hydroxide ($K_2H(OH)$)
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of inorg. **hydride** compound containing hydrino **hydrides**)
- IT 258851-61-5P, Potassium **hydride** iodide (KHI)
 RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
 (preparation of inorg. **hydride** containing hydrino **hydrides**, thermal decomposition, air oxidation/hydrolysis, and characterization by multiple methods)
- IT 258858-21-8P, Potassium carbonate **hydride** ($K_2(HCO_3)H$)
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (preparation of inorg. **hydride**/hydrogen compound containing hydrino **hydrides**)
- L379 ANSWER 81 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 2000:91550 Document No. 132:254691 Fabrication and properties of thin ceramic films deposited on porous substrates. Jacobson, Craig P.; Visco, Steven J.; De Jonghe, Lutgard C. (Lawrence Berkeley National Laboratory, University of California, Berkeley, CA, 94720, USA). Ceramic Transactions, 85(Innovative Processing and Synthesis of Ceramics, Glasses, and Composites), 323-332 (English) 1997. CODEN: CETREW. ISSN: 1042-1122. Publisher: American Ceramic Society.
- AB Bilayers consisting of highly porous substrates and dense thin-films of zirconia, ceria, and perovskite mixed **conductors** ($SrZrO_3$, $SrCeO_3$, and $LaSrCoFeO_3$) have been successfully fabricated using colloidal deposition techniques. The films are well bonded to the substrate, gas tight, and exhibit little interfacial resistance. Performance of solid oxide **fuel cells** (**SOFCs**) based on YSZ **electrolytes** of less than 10 μm have achieved power densities close to 2 W/cm² at 800°C. Ceria based **SOFCs** exhibited excellent electrochem. performance over the **temperature** range of 600 to 800°C with peak power in excess of 650 mW/cm² at 750°C and close to 300 mW/cm² at 600°C. In addition bilayers of thin $SrCeO_3$ and $La_{0.8}Sr_{0.2}Co_{0.8}Fe_{0.2}O_3$ (LSCF) suitable for gas separation or membrane reactors have been fabricated and **fuel cells** based on **proton conducting** $SrZrO_3$ films have also been fabricated and tested. The approach is generic and allows deposition of a variety of thin ceramic films on porous substrates. The methodol. is scaleable and inexpensive, and should allow substantial cost-savings in the manufacture and operation of electrochem. devices in the intermediate **temperature** range of 500-800°C.
- IT 131960-38-8, Strontium yttrium zirconium oxide $SrY_{0.05}Zr_{0.95}O_3$
 RL: DEV (Device component use); PRP (Properties); USES (Uses)
 (films, electrochem. cells; colloidal deposition fabrication and properties of thin oxide ceramic films deposited on porous substrates)
- RN 131960-38-8 HCAPLUS
 CN Strontium yttrium zirconium oxide ($SrY_{0.05}Zr_{0.95}O_3$) (9CI) (CA INDEX NAME)

Component		Ratio		Component
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		Registry Number
O	3	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

CC 57-2 (Ceramics)

Section cross-reference(s): 52

ST oxide film colloidal deposition property porous substrate;
fuel cell oxide film colloidal deposition property
porous substrate

IT Fuel cells

(solid oxide; colloidal deposition fabrication and properties of
thin oxide ceramic films deposited on porous substrates)

IT 118392-69-1, Cobalt lanthanum nickel strontium oxide
Co_{0.98}La_{0.6}Ni_{0.02}Sr_{0.4}O₃ 120605-82-5, Lanthanum manganese
strontium oxide La_{0.85}MnSr_{0.15}O₃

RL: DEV (Device component use); PRP (Properties); USES (Uses)

(cathode, fuel cell; colloidal deposition

fabrication and properties of thin oxide ceramic films deposited
on porous substrates)

IT 1306-38-3, Cerium oxide (CeO₂), properties 1314-23-4, Zirconium
oxide (ZrO₂), properties 12036-39-4, Strontium zirconium oxide
(SrZrO₃) 12267-97-9, Cerate (CeO₃2-), strontium (1:1)

64417-98-7, Yttrium zirconium oxide 114902-12-4, Cobalt iron

lanthanum strontium oxide Co_{0.8}Fe_{0.2}La_{0.8}Sr_{0.2}O₃ 131960-38-8

, Strontium yttrium zirconium oxide SrY_{0.05}Zr_{0.95}O₃ 206191-10-8,

Cerium gadolinium oxide (Ce_{0.8}Gd_{0.2}O_{1.8})

RL: DEV (Device component use); PRP (Properties); USES (Uses)

(films, electrochem. cells; colloidal deposition fabrication and
properties of thin oxide ceramic films deposited on porous
substrates)

L379 ANSWER 82 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1999:737354 Document No. 132:17567 Chemical stability and

proton conductivity of doped BaCeO₃-BaZrO₃ solid

solutions. Ryu, Kwang Hyun; Haile, Sossina M. (Materials Science,
California Institute of Technology, Pasadena, CA, 91125, USA).

Solid State Ionics, 125(1-4), 355-367 (English) 1999. CODEN:

SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

AB Barium cerate has a high proton conductivity but rather
poor chemical stability in CO₂-containing atms. Barium zirconate, in
contrast, is a rather stable material but one that exhibits low
proton conductivity The conductivity and chemical stability of
solid solns. between these compds. were studied, in an attempt to
find a composition exhibiting both high conductivity and good stability.
Compds. BaCe_{0.9-x}Zr_xM_{0.1}O_{3-δ}, where M was Gd or Nd and x
ranged from 0 to 0.4, were prepared by solid state reaction and
characterized by x-ray powder diffraction, TGA in flowing CO₂, DTA
in flowing CO₂, and a.c. impedance spectroscopy in dry and H₂O-saturated
argon. Introduction of Zr into doped barium cerate greatly enhanced
the chemical stability: for the Nd-doped system, compns. with x = 0.2
or higher did not react with CO₂ (under the exptl., nonequil.
conditions), whereas for the Gd-doped system, the composition with x =
0.4 did not react. Not unexpectedly, introduction of Zr also
decreased conductivity and an increase in the activation energy for proton
transport. Overall, Nd-doped samples exhibited higher chemical
stability and lower conductivity than those doped with Gd. The composition
BaCe_{0.7}Zr_{0.2}Nd_{0.1}O_{3-δ} appears to give a good compromise
between conductivity and stability for fuel cell
applications.

IT 123998-55-0D, Barium cerium neodymium zirconium oxide
(BaCe_{0.8}Nd_{0.1}Zr_{0.1}O₃), oxygen-deficient 235098-96-1D,
Barium cerium neodymium zirconium oxide (BaCe_{0.7}Nd_{0.1}Zr_{0.2}O₃),
oxygen-deficient 235098-98-3D, Barium cerium gadolinium

zirconium oxide (BaCe0.8Gd0.1Zr0.1O3), oxygen-deficient
 235099-00-0D, Barium cerium gadolinium zirconium oxide
 (BaCe0.7Gd0.1Zr0.2O3), oxygen-deficient 235099-02-2D,
 Barium cerium neodymium zirconium oxide (BaCe0.6Nd0.1Zr0.3O3),
 oxygen-deficient 251566-53-7D, Barium cerium neodymium
 zirconium oxide (BaCe0.5Nd0.1Zr0.4O3), oxygen-deficient
 251566-55-9D, Barium cerium gadolinium zirconium oxide
 (BaCe0.6Gd0.1Zr0.3O3), oxygen-deficient 251566-57-1D,
 Barium cerium gadolinium zirconium oxide (BaCe0.5Gd0.1Zr0.4O3),
 oxygen-deficient

RL: PRP (Properties)

(chemical stability and proton conductivity of doped
 BaCeO3-BaZrO3 solid solns.)

RN 123998-55-0 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe0.8Nd0.1Zr0.1O3) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-96-1 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe0.7Nd0.1Zr0.2O3) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.2	7440-67-7
Ce	0.7	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-98-3 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe0.8Gd0.1Zr0.1O3) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.1	7440-67-7
Gd	0.1	7440-54-2
Ce	0.8	7440-45-1
Ba	1	7440-39-3

RN 235099-00-0 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe0.7Gd0.1Zr0.2O3) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.2	7440-67-7
Gd	0.1	7440-54-2
Ce	0.7	7440-45-1
Ba	1	7440-39-3

RN 235099-02-2 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe_{0.6}Nd_{0.1}Zr_{0.3}O₃) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.3	7440-67-7
Ce	0.6	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 251566-53-7 HCAPLUS

CN Barium cerium neodymium zirconium oxide (BaCe_{0.5}Nd_{0.1}Zr_{0.4}O₃) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.4	7440-67-7
Ce	0.5	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 251566-55-9 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.6}Gd_{0.1}Zr_{0.3}O₃) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.3	7440-67-7
Gd	0.1	7440-54-2
Ce	0.6	7440-45-1
Ba	1	7440-39-3

RN 251566-57-1 HCAPLUS

CN Barium cerium gadolinium zirconium oxide (BaCe_{0.5}Gd_{0.1}Zr_{0.4}O₃) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.4	7440-67-7
Gd	0.1	7440-54-2
Ce	0.5	7440-45-1
Ba	1	7440-39-3

CC 76-2 (Electric Phenomena)

ST barium cerium zirconium oxide **proton cond**
stability

IT Electric impedance

Ionic **conductors**

Stability

X-ray diffraction

(chemical stability and **proton conductivity** of doped
BaCeO₃-BaZrO₃ solid solns.)

IT Ionic **conductivity**

(**proton**; chemical stability and **proton**
conductivity of doped BaCeO₃-BaZrO₃ solid solns.)

IT 12009-21-1, Barium zirconate (BaZrO₃) 12267-77-5, Barium cerium
oxide (BaCeO₃) 112235-03-7D, Barium cerium neodymium oxide
(BaCe_{0.9}Nd_{0.1}O₃), oxygen-deficient 123998-55-0D, Barium

cerium neodymium zirconium oxide (BaCe_{0.8}Nd_{0.1}Zr_{0.1}O₃),
oxygen-deficient 136575-38-7D, Barium cerium gadolinium oxide
(BaCe_{0.9}Gd_{0.1}O₃), oxygen-deficient 235098-96-1D, Barium
cerium neodymium zirconium oxide (BaCe_{0.7}Nd_{0.1}Zr_{0.2}O₃),
oxygen-deficient 235098-98-3D, Barium cerium gadolinium
zirconium oxide (BaCe_{0.8}Gd_{0.1}Zr_{0.1}O₃), oxygen-deficient
235099-00-0D, Barium cerium gadolinium zirconium oxide
(BaCe_{0.7}Gd_{0.1}Zr_{0.2}O₃), oxygen-deficient 235099-02-2D,
Barium cerium neodymium zirconium oxide (BaCe_{0.6}Nd_{0.1}Zr_{0.3}O₃),
oxygen-deficient 251566-53-7D, Barium cerium neodymium
zirconium oxide (BaCe_{0.5}Nd_{0.1}Zr_{0.4}O₃), oxygen-deficient
251566-55-9D, Barium cerium gadolinium zirconium oxide
(BaCe_{0.6}Gd_{0.1}Zr_{0.3}O₃), oxygen-deficient 251566-57-1D,
Barium cerium gadolinium zirconium oxide (BaCe_{0.5}Gd_{0.1}Zr_{0.4}O₃),
oxygen-deficient

RL: PRP (Properties)

(chemical stability and proton conductivity of doped
BaCeO₃-BaZrO₃ solid solns.)

L379 ANSWER 83 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1999:737346 Document No. 131:339430 Aspects of the formation and
mobility of protonic charge carriers and the stability of
perovskite-type oxides. Kreuer, K. D. (Max-Planck-Institut fur
Festkorperforschung, Stuttgart, D-70569, Germany). Solid State
Ionics, 125(1-4), 285-302 (English) 1999. CODEN: SSIOD3. ISSN:
0167-2738. Publisher: Elsevier Science B.V..

AB Proton conducting acceptor-doped perovskite-type
alkaline earth cerates, zirconates, niobates and titanates have been
investigated exptl. and by numerical simulations. For all cubic
perovskites the concentration of protonic defects almost reaches the
acceptor dopant concentration under appropriate conditions, and the
mobility of protonic defects fall into a narrow range. Any symmetry
reduction, however, leads to a reduction of the concentration and mobility of
protonic defects. For all oxides, dynamical hydrogen bonding is
suggested to lead to a local lattice softening, which provides an
advantageous environment for high proton-mobility. This effect may
explain the very high proton conductivity in covalent
acceptor-doped BaZrO₃, which has been found exptl. for the first
time. Since this oxide also shows good thermodyn. phase stability,
it is an interesting candidate as separator material in high-drain
electrochem. applications such as fuel cells.

IT 153328-13-3D, Strontium yttrium zirconium oxide
(SrY_{0.1}Zr_{0.9}O₃), oxygen-depleted 196817-19-3D, Barium
calcium niobium oxide (BaCa_{0.39}Nb_{0.61}O₃), oxygen-depleted
RL: PRP (Properties); TEM (Technical or engineered material use);
USES (Uses)

(formation, mobility, and stability of perovskite-type oxides)

RN 153328-13-3 HCAPLUS

CN Strontium yttrium zirconium oxide (SrY_{0.1}Zr_{0.9}O₃) (9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.9	7440-67-7
Y	0.1	7440-65-5
Sr	1	7440-24-6

RN 196817-19-3 HCAPLUS

CN Barium calcium niobium oxide (BaCa_{0.39}Nb_{0.61}O₃) (9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
=====	=====	=====

O	3	17778-80-2
Ca	0.39	7440-70-2
Ba	1	7440-39-3
Nb	0.61	7440-03-1

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 57, 76

ST perovskite oxide **proton conductor** stability;
fuel cell perovskite separator stability

IT Activation energy
Electric **conductors**, ceramic
Electric impedance

Fuel cell separators

Helmholtz free energy

Hydration, chemical

Ionic **conductors**

Perovskite-type crystals

Stability

(formation, mobility, and stability of perovskite-type oxides)

IT 113876-58-7D, Barium cerium yttrium oxide (BaCe_{0.9}Y_{0.1}O₃),
oxygen-depleted 142487-25-0, Barium tin yttrium oxide (Ba₂SnY_{0.5}O_{5.5})

153328-13-3D, Strontium yttrium zirconium oxide
(SrY_{0.1}Zr_{0.9}O₃), oxygen-depleted 158919-45-0D, Cerium strontium
yttrium oxide (Ce_{0.9}SrY_{0.1}O₃), oxygen-depleted 160421-61-4D,
Barium cerium yttrium oxide (BaCe_{0.98}Y_{0.02}O₃), oxygen-depleted
196817-19-3D, Barium calcium niobium oxide

(BaCa_{0.39}Nb_{0.61}O₃), oxygen-depleted 226087-55-4D, Scandium
strontium titanium oxide (Sc_{0.05}SrTi_{0.95}O₃), oxygen-depleted
249620-70-0D, Barium scandium titanium oxide (BaSc_{0.05}Ti_{0.95}O₃),
oxygen-depleted 249620-71-1D, Barium yttrium zirconium oxide
(BaY_{0.1}Zr_{0.9}O₃), oxygen-depleted

RL: PRP (Properties); TEM (Technical or engineered material use);
USES (Uses)

(formation, mobility, and stability of perovskite-type oxides)

L379 ANSWER 84 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1999:415936 Document No. 131:146817 Influence of zirconium
substitution on the chemical stability and conductivity of
BaCeO₃-based **proton conductors**. Ryu, Kwang
Hyun; Haile, Sossina M. (Materials Science 138-78, California
Institute of Technology, CA, 91125, USA). Proceedings -
Electrochemical Society, 98-15(Selected Battery Topics), 485-494
(English) 1999. CODEN: PESODO. ISSN: 0161-6374. Publisher:
Electrochemical Society.

AB The impact of zirconium substitution on the conductivity and chemical
stability of doped barium cerate has been investigated. Compds. of
general formula BaCe_{0.9-x}Zr_xM_{0.1}O_{3-δ}, where M was Gd or Nd and
x ranged from 0 to 0.4, were characterized by thermal gravimetric
anal. in flowing CO₂, DTA in flowing CO₂, and impedance spectroscopy
in dry and H₂O-saturated argon. Introduction of Zr into doped barium
cerate greatly enhanced the chemical stability: for the Nd-doped
system, compns. with x = 0.2 or higher did not react with CO₂ (under
the exptl., nonequil. conditions), whereas for the Gd-doped system,
the composition with x = 0.4 did not react. Introduction of Zr also led
to a decrease in conductivity and an increase in the activation energy for
proton transport. Overall, Nd-doped samples exhibited higher chemical
stability and lower conductivity than those doped with Gd. The composition
BaCe_{0.7}Zr_{0.2}Nd_{0.1}O_{3-δ}, appears to give a good compromise
between conductivity and stability for **fuel cell**
applications.

IT 123998-55-0D, Barium cerium neodymium zirconium oxide
BaCe_{0.8}Nd_{0.1}Zr_{0.1}O₃, oxygen-deficient 235098-96-1D, Barium
cerium neodymium zirconium oxide (BaCe_{0.7}Nd_{0.1}Zr_{0.2}O₃),
oxygen-deficient 235098-98-3D, Barium cerium gadolinium
zirconium oxide (BaCe_{0.8}Gd_{0.1}Zr_{0.1}O₃), oxygen-deficient
235099-00-0D, Barium cerium gadolinium zirconium oxide

(BaCe_{0.7}Gd_{0.1}Zr_{0.2}O₃), oxygen-deficient 235099-02-2D,
 Barium cerium neodymium zirconium oxide (BaCe_{0.6}Nd_{0.1}Zr_{0.3}O₃),
 oxygen-deficient
 RL: PRP (Properties)
 (influence of zirconium substitution on chemical stability and conductivity
 of BaCeO₃-based **proton conductors**)
 RN 123998-55-0 HCAPLUS
 CN Barium cerium neodymium zirconium oxide (BaCe_{0.8}Nd_{0.1}Zr_{0.1}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-96-1 HCAPLUS
 CN Barium cerium neodymium zirconium oxide (BaCe_{0.7}Nd_{0.1}Zr_{0.2}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.2	7440-67-7
Ce	0.7	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

RN 235098-98-3 HCAPLUS
 CN Barium cerium gadolinium zirconium oxide (BaCe_{0.8}Gd_{0.1}Zr_{0.1}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.1	7440-67-7
Gd	0.1	7440-54-2
Ce	0.8	7440-45-1
Ba	1	7440-39-3

RN 235099-00-0 HCAPLUS
 CN Barium cerium gadolinium zirconium oxide (BaCe_{0.7}Gd_{0.1}Zr_{0.2}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.2	7440-67-7
Gd	0.1	7440-54-2
Ce	0.7	7440-45-1
Ba	1	7440-39-3

RN 235099-02-2 HCAPLUS
 CN Barium cerium neodymium zirconium oxide (BaCe_{0.6}Nd_{0.1}Zr_{0.3}O₃) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2

Zr	0.3	7440-67-7
Ce	0.6	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 76

ST zirconium barium cerium oxide **proton conductor**;
fuel cell electrolyte proton conductor

IT Electric conductivity
Fuel cell electrolytes
Ionic conductors
 (influence of zirconium substitution on chemical stability and conductivity of BaCeO₃-based **proton conductors**)

IT 112235-03-7D, Barium cerium neodymium oxide BaCe_{0.9}Nd_{0.1}O₃, oxygen-deficient 123998-55-0D, Barium cerium neodymium zirconium oxide BaCe_{0.8}Nd_{0.1}Zr_{0.1}O₃, oxygen-deficient 136575-38-7D, Barium cerium gadolinium oxide BaCe_{0.9}Gd_{0.1}O₃, oxygen-deficient 235098-96-1D, Barium cerium neodymium zirconium oxide (BaCe_{0.7}Nd_{0.1}Zr_{0.2}O₃), oxygen-deficient 235098-98-3D, Barium cerium gadolinium zirconium oxide (BaCe_{0.8}Gd_{0.1}Zr_{0.1}O₃), oxygen-deficient 235099-00-0D, Barium cerium gadolinium zirconium oxide (BaCe_{0.7}Gd_{0.1}Zr_{0.2}O₃), oxygen-deficient 235099-02-2D, Barium cerium neodymium zirconium oxide (BaCe_{0.6}Nd_{0.1}Zr_{0.3}O₃), oxygen-deficient
 RL: PRP (Properties)
 (influence of zirconium substitution on chemical stability and conductivity of BaCeO₃-based **proton conductors**)

L379 ANSWER 85 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1999:388624 Document No. 131:61182 Solid **electrolyte fuel cells** for gas leakage prevention. Miyashita, Tomofumi; Suwahara, Hisashi; Seike, Satoshi; Noguchi, Yoshitaka; Imasawa, Chieko (Meidensha Electric Mfg. Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11162483 A2 19990618 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-322562 19971125.

AB In the **fuel cells**, the solid **electrolyte** has a protective layer having conductivity to electron and ion, and the layer is formed on the H electrode (anode) side. Preferably, the protective layer comprises an oxide having an O-deficient perovskite-type crystal structure obtained by doping an oxide containing trivalent (+3) rare earth metal to perovskite having conductivity to O ion. The protective layer may contain Ni. Gas leakage caused by crack of the solid **electrolyte** is prevented by the protective layer.

IT 201597-70-8P, Strontium yttrium zirconium oxide
 RL: DEV (Device component use); MOA (Modifier or additive use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
 (fuel cell having O-deficient perovskite-type oxide as protective layer on anode side of solid **electrolyte** for gas leakage prevention)

RN 201597-70-8 HCAPLUS
 CN Strontium yttrium zirconium oxide (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	x	17778-80-2
Zr	x	7440-67-7
Y	x	7440-65-5
Sr	x	7440-24-6

IC ICM H01M008-02
 ICS H01M008-12

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

- Section cross-reference(s): 76
- ST solid electrolyte protective layer fuel cell; perovskite oxide coating electrolyte fuel cell
- IT Electric conductors
 Ionic conductors
 Perovskite-type crystals
 Solid state fuel cells
 (fuel cell having O-deficient perovskite-type oxide as protective layer on anode side of solid electrolyte for gas leakage prevention)
- IT 1313-99-1, Nickel oxide (NiO), uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (dopant; fuel cell having O-deficient perovskite-type oxide as protective layer on anode side of solid electrolyte for gas leakage prevention)
- IT 54847-17-5P, Magnesium yttrium zirconium oxide 134883-97-9P, Calcium yttrium zirconium oxide 142448-13-3P, Barium cerium yttrium oxide 153728-43-9P, Calcium gadolinium zirconium oxide 158292-98-9P, Barium cerium gadolinium oxide 158292-99-0P, Barium cerium neodymium oxide 158970-15-1P, Cerium samarium strontium oxide 161077-89-0P, Calcium cerium yttrium oxide 163294-84-6P, Barium yttrium zirconium oxide 173353-18-9P, Cerium magnesium yttrium oxide 201597-65-1P, Magnesium neodymium zirconium oxide 201597-66-2P, Calcium neodymium zirconium oxide 201597-68-4P, Neodymium strontium zirconium oxide 201597-70-8P, Strontium yttrium zirconium oxide 228264-87-7P, Gadolinium magnesium zirconium oxide 228264-88-8P, Magnesium scandium zirconium oxide 228264-89-9P, Magnesium samarium zirconium oxide 228264-90-2P, Calcium scandium zirconium oxide 228264-91-3P, Calcium samarium zirconium oxide 228264-92-4P, Gadolinium strontium zirconium oxide 228264-93-5P, Scandium strontium zirconium oxide 228264-94-6P, Samarium strontium zirconium oxide 228264-95-7P, Barium neodymium zirconium oxide 228264-96-8P, Barium gadolinium zirconium oxide 228264-97-9P, Barium scandium zirconium oxide 228264-98-0P, Barium samarium zirconium oxide 228264-99-1P, Cerium magnesium neodymium oxide 228265-00-7P, Cerium gadolinium magnesium oxide 228265-01-8P, Cerium magnesium scandium oxide 228265-02-9P, Cerium magnesium samarium oxide 228265-03-0P, Calcium cerium neodymium oxide 228265-04-1P, Calcium cerium gadolinium oxide 228265-05-2P, Calcium cerium scandium oxide 228265-06-3P, Calcium cerium samarium oxide 228265-07-4P, Cerium strontium yttrium oxide 228265-08-5P, Cerium neodymium strontium oxide 228265-09-6P, Cerium gadolinium strontium oxide 228265-10-9P, Cerium scandium strontium oxide 228265-11-0P, Barium cerium scandium oxide 228265-12-1P, Barium cerium samarium oxide
 RL: DEV (Device component use); MOA (Modifier or additive use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
 (fuel cell having O-deficient perovskite-type oxide as protective layer on anode side of solid electrolyte for gas leakage prevention)
- L379 ANSWER 86 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1998:678199 Document No. 130:17596 Structure and Chemical Composition of a Surfactant-Stabilized Pt3Sn Alloy Colloid. Boennemann, H.; Britz, P.; Vogel, W. (Max-Planck-Institut fuer Kohlenforschung, Muelheim an der Ruhr, 45470, Germany). Langmuir, 14(23), 6654-6657 (English) 1998. CODEN: LANGD5. ISSN: 0743-7463. Publisher: American Chemical Society.
- AB A tetraoctylammonium-stabilized PtSn colloid with nominal composition Pt3Sn has been prepared by coredn. of the metal salts. This colloid, which is used in the manufacture of anode catalysts for low-temperature polymer membrane fuel cells, was supported on silica and the structure studied by in situ X-ray diffraction and Debye function anal. Results indicate that the supported colloid is best

described as a highly disordered bimetallic fcc cluster with a particle size of .apprx.1.3 nm. From TEM images a slightly larger size of 1.5 ± 4 nm is derived. Point-resolved EDX (energy-dispersive X-ray spectroscopy) confirms the elemental ratio of 3:1 in the PtSn particles. However, the XRD simulation indicates some deviations from uniform alloy formation. On removal of the stabilizing tetraoctylammonium ligands by heating the samples in He to .apprx.200°C, coalescence of neighboring particles occurs. The new alloy formed consists of a majority of cubic Pt_{0.81}Sn_{0.19} particles, with average size 3.1 nm, and a minority phase of stoichiometric hexagonal PtSn, 4.4 nm in size. The former phase can be considered as a metastable supersatd. solid solution of Sn in Pt. The two phases are stable even on heating to 375°C for 1.5 h in He.

IT 7772-99-8, Tin dichloride, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (structure and chemical composition of a surfactant-stabilized Pt₃Sn alloy colloid)
 RN 7772-99-8 HCAPLUS
 CN Tin chloride (SnCl₂) (8CI, 9CI) (CA INDEX NAME)

Cl-Sn-Cl

CC 66-4 (Surface Chemistry and Colloids)
 Section cross-reference(s): 67
 IT 7772-99-8, Tin dichloride, reactions 10025-65-7, Platinum dichloride 22560-21-0
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (structure and chemical composition of a surfactant-stabilized Pt₃Sn alloy colloid)
 IT 7631-86-9, Silica, processes
 RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
 (supports; structure and chemical composition of a surfactant-stabilized Pt₃Sn alloy colloid)

L379 ANSWER 87 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1998:283066 Document No. 128:310400 LSM-YSZ cathodes for medium-temperature solid oxide fuel cells. Tsai, Tsepin; Barnett, Scott A. (Department of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208, USA). Proceedings - Electrochemical Society, 97-40(Solid Oxide Fuel Cells), 368-377 (English) 1997. CODEN: PESODO. ISSN: 0161-6374. Publisher: Electrochemical Society.
 AB The effect of cathode composition, processing, and structure on the performance of medium-temperature (600-800°) solid oxide fuel cells (SOFCs) is described. The SOFC cathodes were two-phase mixts. of (La_{1-x}Sr_x)_{1-y}MnO₃ (LSM) and yttria-stabilized zirconia (YSZ). The electrolytes were <10 .mu.m thick YSZ, and the anodes were Ni-YSZ with Y-doped CeO₂ interfacial layers. The cathode overpotential was the primary factor limiting cell power densities. Increasing the YSZ volume fraction in LSM-YSZ cathodes from 0 to 60% reduced the low-current area-specific resistance of the cells (in air and humidified hydrogen) from .apprx.3.3 to 0.7 Ω cm² at 750°. The use of LSM with y=0.1 suppressed the formation of zirconate phases during cathode sintering. Optimal cathode porosity was ≈40%. The maximum power densities measured in humidified H₂ and air ranged from .apprx.110 mW/cm² at 600 to 470 mW/cm² at 800°.
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 IT Fuel cell cathodes
 Solid state fuel cells

(lanthanum strontium manganite/yttria-stabilized zirconia cathodes for medium-temperature solid oxide fuel cells)

IT 1314-36-9, Yttria, uses
 RL: DEV (Device component use); USES (Uses)
 (ZrO₂ stabilized with; lanthanum strontium manganite/yttria-stabilized zirconia cathodes for medium-temperature solid oxide fuel cells)

IT 108916-22-9, Lanthanum manganese strontium oxide 1a0.8mnsr0.2o3
 112721-99-0 114168-16-0, Tz-8y 139737-59-0, Lanthanum manganese strontium oxide 1a0.72mnsr0.18o3 188185-44-6, Cerium yttrium oxide Ce0.84Y0.32O2.16
 RL: DEV (Device component use); USES (Uses)
 (lanthanum strontium manganite/yttria-stabilized zirconia cathodes for medium-temperature solid oxide fuel cells)

IT 1314-23-4, Zirconia, uses
 RL: DEV (Device component use); USES (Uses)
 (yttria-stabilized; lanthanum strontium manganite/yttria-stabilized zirconia cathodes for medium-temperature solid oxide fuel cells)

L379 ANSWER 88 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1998:32507 Document No. 128:131285 Heavy-water (D₂O) take-up-induced lattice expansion in the high-temperature proton conductor Ba₃Ca_{1.18}Nb_{1.82}O_{9-δ}. Papathanassopoulos, Konstantinos; Wenzl, Helmut; Schober, Tilman (Inst. für Festkörperforschung, Jülich, 52425, Germany). Journal of the American Ceramic Society, 80(12), 3278-3280 (English) 1997. CODEN: JACTAW. ISSN: 0002-7820. Publisher: American Ceramic Society.

AB Dimensional changes of the high-temperature proton conductor Ba₃Ca_{1.18}Nb_{1.82}O_{9-δ}, when exposed to D₂O vapor, were investigated using length-change and precision d. measurements. Such information is essential for possible applications of proton conductors in solid oxide fuel cells and humidity and hydrogen sensors. A linear increase of the sample lengths with increases in the deuterium content was observed. Comparison of the present D₂O data with those that were previously obtained for H₂O showed that there was a small isotope effect in the lattice expansion. The fact that the length-change-vs.-hydrogen-isotope-concentration curves were almost isotope independent supported the validity of the take-up reaction according to Wagner classic equation (1996). In regard to this equation, it was found that small islands of silver, palladium, nickel, and platinum act as catalytic promoters of the reaction and lead, for given heavy-water-steam exposure conditions, to an increase of water absorption of up to 100%, when compared with samples without the catalytic surface layers.

IT 158634-63-0D, Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O₉), oxygen-deficient
 RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)

(proton conductor; heavy-water (D₂O) take-up-induced lattice expansion in high-temperature proton conductor Ba₃Ca_{1.18}Nb_{1.82}O_{9-δ})

RN 158634-63-0 HCAPLUS

CN Barium calcium niobium oxide (Ba₃Ca_{1.18}Nb_{1.82}O₉) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	9	17778-80-2
Ca	1.18	7440-70-2
Ba	3	7440-39-3
Nb	1.82	7440-03-1

CC 57-2 (Ceramics)

- Section cross-reference(s): 52, 76
- .ST barium calcium niobate **proton conductor**
expansion; heavy water lattice expansion **proton conductor**; niobate **proton conductor**
heavy water expansion
- IT Electric **conductors**
(barium calcium niobate; heavy-water (D2O) take-up-induced
lattice expansion in high-**temperature proton conductor** Ba3Ca1.18Nb1.82O9-8)
- IT Crystal structure
(lattice expansion; heavy-water (D2O) take-up-induced lattice
expansion in high-**temperature proton conductor** Ba3Ca1.18Nb1.82O9-8)
- IT Expansion
(lattice; heavy-water (D2O) take-up-induced lattice expansion in
high-**temperature proton conductor** Ba3Ca1.18Nb1.82O9-8)
- IT 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4,
Platinum, uses 7440-22-4, Silver, uses
RL: CAT (Catalyst use); USES (Uses)
(catalyst; heavy-water (D2O) take-up-induced lattice expansion in
high-**temperature proton conductor** Ba3Ca1.18Nb1.82O9-8)
- IT 158634-63-0D, Barium calcium niobium oxide
(Ba3Ca1.18Nb1.82O9), oxygen-deficient
RL: PRP (Properties); TEM (Technical or engineered material use);
USES (Uses)
(**proton conductor**; heavy-water (D2O)
take-up-induced lattice expansion in high-**temperature proton conductor** Ba3Ca1.18Nb1.82O9-8)
- IT 7732-18-5, Water, processes
RL: MOA (Modifier or additive use); PEP (Physical, engineering or
chemical process); PROC (Process); USES (Uses)
(uptake; heavy-water (D2O) take-up-induced lattice expansion in
high-**temperature proton conductor** Ba3Ca1.18Nb1.82O9-8)

L379 ANSWER 89 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1998:9778 Document No. 128:50630 **Proton-conducting**
cerate ceramics. Pederson, L. R.; Coffey, G. W.; Bates, J. L.;
Weber, W. J. (Pacific Northwest National Laboratory, Richland, WA,
99352, USA). Oak Ridge National Laboratory, [Report] ORNL/FMP
(United States), ORNL/FMP-96/1, Proceedings of the Tenth Annual
Conference on Fossil Energy Materials, 1996, 311-318 (English) 1996.
CODEN: ORFMEY.

- AB Single-cell solid oxide **fuel cells**
were constructed using strontium cerate as the **electrolyte**
and their performance tested. Like certain zirconates, hafnates,
and tantalates, the cerate perovskites are among a class of solid
electrolytes that **conduct protons** at
elevated **temps**. Depending on the **temperature** and
chemical environment, these ceramics also **support** electronic
and oxygen ion currents. A maximum power output of
≈100 mW per cm² **electrolyte surface area**
was obtained at 900°C using 4% hydrogen as the fuel and air
as the oxidant. A series of rare earth/ceria/zirconia were prepared
and their elec. properties characterized. Rare earth dopants
included ytterbia, yttria, terbia, and europia. **Ionic**
conductivities were highest for rare earth/ceria and rare earth
zirconia compns.; a min. in **ionic conductivity** for all series
were found for equimolar mixts. of ceria and zirconia. Cerium
oxysulfide is of interest in fossil energy applications because of
its high chemical stability and refractory nature. An alternative
synthesis route to preparing cerium oxysulfide powders have been
developed using combustion techniques.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 57, 76

ST solid oxide fuel cell electrolyte;
strontium cerate electrolyte fuel cell
; rare earth ceria zirconia ionic cond

IT Fuel cell electrolytes
Ionic conductivity
Solid state fuel cells
(proton-conducting cerate ceramic
electrolytes for solid oxide fuel cells
)

IT 200067-60-3, Cerium ytterbium oxide (Ce_{0.8}Yb₂O_{4.6}) 200067-61-4,
Ytterbium zirconium oxide (Yb₂Zr_{0.8}O_{4.6}) 200067-62-5, Cerium
ytterbium zirconium oxide (Ce_{0.1}Yb₂Zr_{0.7}O_{4.6}) 200067-63-6, Cerium
ytterbium zirconium oxide (Ce_{0.2}Yb₂Zr_{0.6}O_{4.6}) 200067-64-7, Cerium
ytterbium zirconium oxide (Ce_{0.6}Yb₂Zr_{0.2}O_{4.6}) 200067-65-8, Cerium
ytterbium zirconium oxide (Ce_{0.4}Yb₂Zr_{0.4}O_{4.6}) 200067-66-9, Cerium
yttrium oxide (Ce_{0.8}Y₂O_{4.6}) 200067-67-0, Yttrium zirconium oxide
(Y₂Zr_{0.8}O_{4.6}) 200067-68-1, Cerium yttrium zirconium oxide
(Ce_{0.1}Y₂Zr_{0.7}O_{4.6}) 200067-69-2, Cerium yttrium zirconium oxide
(Ce_{0.2}Y₂Zr_{0.6}O_{4.6}) 200067-71-6, Cerium yttrium zirconium oxide
(Ce_{0.6}Y₂Zr_{0.2}O_{4.6}) 200067-72-7, Cerium yttrium zirconium oxide
(Ce_{0.4}Y₂Zr_{0.4}O_{4.6}) 200067-73-8, Cerium terbium oxide
(Ce_{0.8}Tb₂O_{4.6}) 200067-74-9, Terbium zirconium oxide (Tb₂Zr_{0.8}O_{4.6})
200067-75-0, Cerium terbium zirconium oxide (Ce_{0.1}Tb₂Zr_{0.7}O_{4.6})
200067-76-1, Cerium terbium zirconium oxide (Ce_{0.2}Tb₂Zr_{0.6}O_{4.6})
200067-77-2, Cerium terbium zirconium oxide (Ce_{0.6}Tb₂Zr_{0.2}O_{4.6})
200067-78-3, Cerium terbium zirconium oxide (Ce_{0.4}Tb₂Zr_{0.4}O_{4.6})
200067-79-4, Cerium europium oxide (Ce_{0.8}Eu₂O_{4.6}) 200067-80-7,
Europium zirconium oxide (Eu₂Zr_{0.8}O_{4.6}) 200067-81-8, Cerium
europium zirconium oxide (Ce_{0.1}Eu₂Zr_{0.7}O_{4.6}) 200067-82-9, Cerium
europium zirconium oxide (Ce_{0.2}Eu₂Zr_{0.6}O_{4.6}) 200067-83-0, Cerium
europium zirconium oxide (Ce_{0.6}Eu₂Zr_{0.2}O_{4.6}) 200067-84-1, Cerium
europium zirconium oxide (Ce_{0.4}Eu₂Zr_{0.4}O_{4.6})
RL: DEV (Device component use); USES (Uses)
(proton-conducting cerate ceramic
electrolytes for solid oxide fuel cells
)

L379 ANSWER 90 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1997:740153 Document No. 127:360570 Method of manufacturing composite
membrane structures comprising a thin metal membrane for
use in selective diffusion of gases. Bredesen, Rune; Klette,
Hallgeir (Sintef, Norway; Bredesen, Rune; Klette, Hallgeir). PCT
Int. Appl. WO 9740914 A1 19971106, 17 pp. DESIGNATED STATES: W:
AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK,
EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK,
LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU,
SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, AM, AZ,
BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM,
DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT,
SE, SN, TD, TG. (Norwegian). CODEN: PIXXD2. APPLICATION: WO
1997-NO109 19970425. PRIORITY: NO 1996-1739 19960430.

AB Method for manufacturing a composite membrane structure comprising a thin
metal membrane, e.g., silver, palladium
or palladium alloys, for use in selective
diffusion of gases. The metal for the membranes is
applied by sputtering and/or vapor deposition to base member having
low surface roughness in a desired thickness, the
coating is pulled off from the base member to form a
membrane, and the metal membrane is placed on a
supporting substrate. The metal is selected from
Ag, Pd, and Pd alloys.

IT 7440-05-3, Palladium, uses 7440-22-4,
Silver, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(membranes, supported; for selective separation of gases)

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
 CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IC ICM B01D039-10
 ICS B01D053-22

CC 48-1 (Unit Operations and Processes)
 Section cross-reference(s): 49, 52

ST gas diffusion **metal** membrane **support**;
silver membrane **support** sensor; **palladium**
alloy membrane **support**; cylinder **metal**
 membrane sputtering; vapor deposition **metal** membrane
 cylinder; silicon **metal** membrane sputtering; glass
metal membrane sputtering; quartz **metal** membrane
 sputtering; oxide **metal** membrane sputtering

IT Cylinders
 (base members; in **supported metal** membrane
 manufacture for selective separation of gases)

IT Nitrides
 Oxides (inorganic), uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (base members; in **supported metal** membrane
 manufacture for selective separation of gases)

IT **Metals**, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membranes, **supported**; for selective separation of gases)

IT Membranes, nonbiological
 RL: TEM (Technical or engineered material use); USES (Uses)
 (**metallic, supported**; for selective separation of
 gases)

IT Electrodes
 (**silver** or **palladium** and **palladium**
alloy membranes; for oxygen-conductive or
hydrogen-conductive electrolytes in
fuel cells and gas sensors)

IT Gases
 (**supported metal** membrane manufacture for
 selective separation of)

IT **Fuel cells**
 Sensors
 (**supported thin metal** membrane manufacture for)

IT **Palladium alloy**
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membranes, **supported**; for selective separation of gases)

IT 7440-21-3, Silicon, uses 14808-60-7, Quartz, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (base members; in **supported metal** membrane
 manufacture for selective separation of gases)

IT 7440-05-3, **Palladium**, uses 7440-22-4,
Silver, uses
 RL: TEM (Technical or engineered material use); USES (Uses)
 (membranes, **supported**; for selective separation of gases)

IT 1333-74-0P, Hydrogen, preparation
 RL: PUR (Purification or recovery); PREP (Preparation)
 (**supported thin metal** membrane manufacture for
 purification of)

L379 ANSWER 91 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1997:138492 Document No. 126:227570 Effect of LSM-YSZ cathode on thin-electrolyte solid oxide fuel cell

performance. Tsai, Tsepin; Barnett, Scott A. (Department of Materials Science and Engineering, Northwestern University, Evanston, IL, USA). Solid State Ionics, 93(3,4), 207-217 (English) 1997. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier.

AB The effect of cathode composition, processing and structure on the performance of medium-temperature (600-800°) solid oxide fuel cells (SOFCs) is described. The cathodes and phys. supports for the SOFCs were two-phase mixts. of (La_{1-x}Sr_x)_{1-y}MnO₃ (LSM) and Yttria-stabilized Zirconia (YSZ), the electrolytes were <10 μm thick YSZ, and the anodes were Ni-YSZ with Y-doped CeO₂ interfacial layers. It was found that the cathode overpotential was the primary factor limiting cell power densities during operation with air as the oxidant and humidified hydrogen as the fuel. Increasing the YSZ volume fraction in LSM-YSZ cathodes from 0 to 60% reduced the low-current area-specific resistance of the cells (in air and humidified hydrogen) from .apprx.3.3 to 0.7 Ωcm². The use of LSM with y = 0.1 suppressed the formation of zirconate phases during cathode sintering. Optimal cathode porosity was ≈40%. Decreasing the cathode porosity below ≈30% resulted in a mass transport limitation at high current densities due to the small pore size (<0.5 μm) and large cathode thickness (≈1 mm). The maximum power densities measured in humidified H₂ and air ranged from .apprx.110 mWcm⁻² at 600 to 470 mWcm⁻² at 800°.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Fuel cell cathodes

(effect of lanthanum strontium manganite/Y₂O₃-stabilized ZrO₂ cathode on thin-electrolyte solid oxide fuel cell performance)

IT 188185-44-6, Cerium yttrium oxide (Ce_{0.84}Y_{0.32}O_{2.16})

RL: DEV (Device component use); USES (Uses)

(anode interfacial layer; effect of lanthanum strontium manganite/Y₂O₃-stabilized ZrO₂ cathode on thin-electrolyte solid oxide fuel cell performance)

IT 112721-99-0

RL: DEV (Device component use); USES (Uses)

(anodes; effect of lanthanum strontium manganite/Y₂O₃-stabilized ZrO₂ cathode on thin-electrolyte solid oxide fuel cell performance)

IT 108916-22-9, Lanthanum manganese strontium oxide La_{0.8}MnSr_{0.2}O₃

114168-16-0, Yttrium zirconium oxide (Y_{0.16}Zr_{0.92}O_{2.08})

139737-59-0, Lanthanum manganese strontium oxide La_{0.72}MnSr_{0.18}O₃

188185-43-5, Lanthanum manganese strontium oxide (La_{0.79}MnSr_{0.19}O₃)

RL: DEV (Device component use); USES (Uses)

(effect of lanthanum strontium manganite/Y₂O₃-stabilized ZrO₂ cathode on thin-electrolyte solid oxide fuel cell performance)

L379 ANSWER 92 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1996:315458 Document No. 124:348141 Solid polymer electrolyte

fuel cells and their manufacture. Imahashi, Jinichi; Horiba, Tatsuo (Hitachi Ltd, Japan). Jpn. Kokai Tokkyo Koho JP 08088011 A2 19960402 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-222332 19940919.

AB The fuel cells have a pair of electrodes having gas diffusion layers on the opposite sides of a solid polymer electrolyte membrane and means for supplying reaction gas for the electrodes; where either or both electrodes have a catalyst layer on the electrolyte membrane

side of the gas diffusion layer, and the electrolyte membrane has, at least on 1 side, a copptd. layer containing an active material. The copptd. layer contains at least a C support, an active material, e.g., a Pt group metal, loaded on the support, a proton conductor, and a hydrophobic binder. The fuel cells are manufactured by adding a mixture containing a Pt compound, the C support, the proton conductor, and the binder on the top side of a polymer electrolyte membrane in a sealed container; stirring the mixture; adding a reducing agent to the bottom side of the electrolyte membrane; heating the container at a predetd. temperature for a predetd. period to reduce the Pt compound to form the copptd layer on the electrolyte membrane; applying a paste containing C or Pt laded C catalyst powder, the proton conductor, and the hydrophobic binder to form the gas diffusion layers; drying at a predetd. temperature to form the electrodes; and hot pressing.

- IC ICM H01M008-02
ICS H01M004-86; H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST solid polymer electrolyte fuel cell
manuf; copptn catalyst layer fuel cell
- IT **Fuel cells**
(fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
- IT Polyoxyalkylenes, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fluorine- and sulfo-containing, ionomers, fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
- IT Fluoropolymers
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylene-, sulfo-containing, ionomers, fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
- IT **Ionomers**
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyoxyalkylenes, fluorine- and sulfo-containing, fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
- IT 7440-06-4, Platinum, uses 7782-42-5, Graphite, uses
RL: CAT (Catalyst use); DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
- IT 9002-84-0, Ptfе
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(fuel cells having copptd. layers containing catalyst and proton conductor and hydrophobic binder on solid polymer electrolyte membranes and their manufacture)
- IT 50-00-0, Formalin, reactions 302-01-2, Hydrazine, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reducing agent in manufacture of copptd. layers containing catalyst and

proton conductor and hydrophobic binder on solid polymer electrolyte membranes for fuel cells)

L379 ANSWER 93 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1996:30548 Document No. 124:161486 Advanced electrolytes and synthesis of advanced catalysis and membrane materials. Armstrong, T. R.; Bates, J. L.; Coffey, G. W.; Kingsley, J. J.; Pederson, I. R.; Stevenson, J. W.; Weber, W. J.; Youngblood, G. E. (Pacific Northwest Lab., Richland, WA, 99352, USA). Oak Ridge National Laboratory, [Report] ORNL/FMP (United States), ORNL/FMP--94/1, Proceedings of the Eighth Annual Conference on Fossil Energy Materials, 1994, 89-96 (English) 1994. CODEN: ORFMEY.

AB Mixed conductors in the lanthanum strontium cobalt chromium iron oxide system and **protonic conductors** in the strontium ytterbium cerate system are being evaluated for possible use in gas separation and purification, as **electrolytes** and electrodes in solid oxide **fuel cells**, and as sensors. Recent activities include materials synthesis, sintering behavior studies, and microstructural characterization, development of methods to prepare novel shapes, elec. property characterization, and permeation testing. Single-phase LaSrCoCrFe oxides, being investigated for use as dense oxygen separation membranes, have been prepared by combustion methods. Sintering conditions were developed to obtain full d. The addition of up to 10 mol% chromium, intended to improve the stability in a reducing environment, also significantly enhanced densification via liquid phase sintering. Compns. having a high A-site strontium content (80% or greater) were susceptible to internal cracking during cooling, due to large changes in oxygen stoichiometry. These are highly (mixed) conductive materials, with activation energies for conduction in the 0.08 to 0.17 eV range and conductivities to more than 500 S/cm. Passive oxygen fluxes varied with **temperature**, composition, and the oxygen concentration gradient. At 1000°, high- purity oxygen fluxes in excess of 1 sccm/cm² **surface area** of the membrane were observed **Protonic conductivity** in the strontium ytterbium cerates was shown to have a large grain boundary component. **Protonic conductivity** in these materials requires the presence of water, which reacts with oxygen vacancies to yield hydroxyl groups that **support proton conduction**. Transference nos. were determined for protons, oxygen ions, and electrons as a function of **temperature** **Protonic conduction** dominated in hydrated cerates up to 450°. At higher **temps.**, oxygen ion and electronic conductivity became progressively more important. Hydrogen could be pumped across the cerate membrane by applying a d.c. voltage. At 800°, pure **hydrogen fluxes** greater than 1 sccm/cm² could be driven across the membrane.

CC 76-2 (Electric Phenomena)

Section cross-reference(s): 52

ST electrolyte lanthanum strontium cobalt iron oxide; **proton conductor** strontium cerium ytterbium oxide; catalyst mixed oxide synthesis; membrane mixed oxide synthesis

IT 110687-91-7D, Cerium Strontium Ytterbium oxide (Ce_{0.95}SrYb_{0.05}O₃), oxygen-deficient 122573-60-8D, Cerium Strontium Ytterbium oxide (Ce_{0.9}SrYb_{0.1}O₃), oxygen-deficient 144438-87-9D, Cerium Strontium Ytterbium oxide (Ce_{0.85}SrYb_{0.15}O₃), oxygen-deficient

RL: PRP (Properties)

(**protonic conduction** in)

L379 ANSWER 94 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1995:767898 Document No. 123:180363 **Supported metal** catalyst and its manufacture. Yamaguchi, Motoo; Kobayashi, Kenzo; Matsuo, Hisahide; Uozumi, Shohei (Hitachi Ltd, Japan). Jpn. Kokai Tokkyo Koho JP 07155618 A2 19950620 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-304957 19931206.

AB The catalyst is manufactured by bombarding a C support with ionic or atomic beams to form C-supported metal particles. The catalysts may contain Pt, Au, Ag, Pd, Ru, and/or Rh and promoters containing particles selected from Fe, Ni, Co, Cr, Ir, Ga, Ti, V, and Al. The process uses an ion-implantation apparatus. The catalyst is useful for electrodes for fuel cells, oxidation catalysts for hydrocarbons or CO, etc. The catalyst showed high activity.

IT 7440-05-3, Palladium, uses 7440-22-4, Silver, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IT 7440-02-0, Nickel, uses 7440-32-6, Titanium, uses 7440-47-3, Chromium, uses 7440-62-2, Vanadium, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(promoter; high-activity carbon-supported metal catalyst and its manufacture by bombardment using ion-implantation apparatus)

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IC ICM B01J035-02
ICS B01J021-18; B01J023-40; B01J023-48; B01J023-62; B01J023-64;
B01J023-66; B01J023-89; B01J037-02; H01M004-88; H01M004-90

CC 67-1 (Catalysis, Reaction Kinetics, and Inorganic Reaction Mechanisms)
Section cross-reference(s): 51, 52

ST **metal** catalyst carbon **support** beam bombardment;
ion beam **metal** catalyst manuf; atom beam **metal** catalyst manuf

IT Fluoropolymers
RL: TEM (Technical or engineered material use); USES (Uses)
(adhesive; high-activity carbon-**supported metal** catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT Atomic beams
Catalysts and Catalysis
Ion beams
(high-activity carbon-**supported metal** catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT Carbon black, uses
RL: CAT (Catalyst use); USES (Uses)
(**support**, Denkablack; high-activity carbon-**supported metal** catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT 7440-05-3, **Palladium**, uses 7440-06-4, **Platinum**, uses 7440-16-6, **Rhodium**, uses 7440-18-8, **Ruthenium**, uses 7440-22-4, **Silver**, uses 7440-57-5, **Gold**, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(high-activity carbon-**supported metal** catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT 7429-90-5, **Aluminum**, uses 7439-88-5, **Iridium**, uses 7439-89-6, **Iron**, uses 7440-02-0, **Nickel**, uses 7440-32-6, **Titanium**, uses 7440-47-3, **Chromium**, uses 7440-48-4, **Cobalt**, uses 7440-55-3, **Gallium**, uses 7440-62-2, **Vanadium**, uses
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(promoter; high-activity carbon-**supported metal** catalyst and its manufacture by bombardment using ion-implantation apparatus)

IT 7440-44-0, **Carbon**, uses
RL: CAT (Catalyst use); USES (Uses)
(**support**; high-activity carbon-**supported metal** catalyst and its manufacture by bombardment using ion-implantation apparatus)

L379 ANSWER 95 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1995:440321 Document No. 122:269993 Study of radiation-grafted FEP-g-polystyrene membranes as polymer **electrolytes** in **fuel cells**. Buchi, Felix N.; Gupta, Bhuvanesh; Haas, Otto; Scherer, Gunther G. (Paul Scherrer Inst., Villigen PSI, CH-5232, Switz.). Electrochimica Acta, 40(3), 345-53 (English) 1995. CODEN: ELCAAV. ISSN: 0013-4686. Publisher: Elsevier.

AB Proton exchange membranes for **fuel cell** applications were synthesized by pre-irradiation grafting of styrene/divinylbenzene mixts. into poly(fluoroethylene-co-hexafluoropropylene) **films** and subsequent sulfonation. Grafting of pre-existing **films** overcomes the problem of shaping the grafted polymer into thin membranes and makes this process a potentially cheap and easy technique for the preparation of solid polymer **electrolytes**. The grafted membranes were characterized by measuring their ion exchange capacity, swelling, **specific resistivity** and **area**

- resistance.** Due to their thickness in the range 67-211 μm , some of the membranes have a considerably lower resistance than the most widely used membrane Nafion 117. The short-term and long-term performance of these membranes was investigated in H/O **fuel cells**. Thin (<100 μm), highly crosslinked (12% divinylbenzene) membranes show the best performance in the **fuel cells**. Tests for periods of ≤ 1400 h were performed to examine membrane stability and the degradation of grafted membranes.
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
- IT **Fluoropolymers**
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(membranes; preparation of membranes of fluoroethylene-hexafluoropropylene polymer radiation-grafted with styrene and divinylbenzene and subsequently sulfonated as polymer **electrolytes in fuel cells**)
- IT **Fuel cells**
(separators, proton exchange; preparation of membranes of fluoroethylene-hexafluoropropylene polymer radiation-grafted with styrene and divinylbenzene and subsequently sulfonated as polymer **electrolytes in fuel cells**)
- IT 25067-11-2D, Tetrafluoroethylene-hexafluoropropylene copolymer, radiation-grafted with styrene and divinylbenzene, sulfonated
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(crosslinked; preparation of membranes of fluoroethylene-hexafluoropropylene polymer radiation-grafted with styrene and divinylbenzene and subsequently sulfonated as polymer **electrolytes in fuel cells**)
- IT 100-42-5D, Styrene, fluoroethylene-hexafluoropropylene polymer radiation-grafted with 1321-74-0D, Divinylbenzene, fluoroethylene-hexafluoropropylene polymer radiation-grafted with
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(preparation of membranes of fluoroethylene-hexafluoropropylene polymer radiation-grafted with styrene and divinylbenzene and subsequently sulfonated as polymer **electrolytes in fuel cells**)

- L379 ANSWER 96 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1994:518495 Document No. 121:118495 Potential-Dependent Wetting of Aqueous Solutions on Self-Assembled Monolayers Formed from 15-(Ferrocenylcarbonyl)pentadecanethiol on Gold. Abbott, Nicholas L.; Whitesides, George M. (Department of Chemistry, Harvard University, Cambridge, MA, 02138, USA). Langmuir, 10(5), 1493-7 (English) 1994. CODEN: LANGD5. ISSN: 0743-7463.
- AB Aqueous solns. of 0.1 M NaClO₄ (pH 1.5, 10 mM KH₂PO₄) show potential-dependent wetting on self-assembled monolayers (SAMs) formed from 15-(ferrocenylcarbonyl)pentadecanethiol (FcCO(CH₂)₁₅SH; Fc = [η 5-C₅H₅]Fe[η 5-C₅H₅]) adsorbed on Au **surfaces**. Contact angles (θ) decreased from 71 to 43° ($\Delta \cos \theta = -0.40$) when the elec. potential of the SAM was increased from 0.3 to 0.5 V (vs. a Ag wire reference electrode) and then increased from 43 to 58° when the potential of the SAM was returned to 0.2 V. Repeated cycling between these potentials leads to a progressively decreasing response, as the Fc groups are destroyed by **side reactions**. Contact angles of aqueous solns. on SAMs formed from CH₃(CH₂)₁₇SH decrease by only 2° (from .apprx. 115 to 113°, $\Delta \cos \theta = 0.05$) over the same range of potentials (J. Sondag-Huethorst and L. Fokkink, 1992). The contrast between the wettability of SAMs terminated with Fc and CH₃ groups suggests that potential-dependent wetting of the former is caused primarily by the electrochem. oxidation of the elec.

neutral, **surface**-confined **Fc** to the more polar and plausibly more wettable **Fc⁺ cation**. Linear sweep cyclic voltammetric measurements **support** this hypothesis. **Surfaces** of Au patterned with SAMs formed from **FcCO(CH₂)₁₅SH** and **CH₃(CH₂)₁₅SH** were used to construct a micrometer-scale "gate" that controls the flow of liquid down a **surface**.

- CC 66-4 (Surface Chemistry and Colloids)
Section cross-reference(s): 47, 72, 76
- ST micrometer gate **surface** flow control liq; potential dependent wetting self assembled monolayer; ferrocenylcarbonylpentadecanethiol self assembled monolayer gold electrowetting; electrochem oxidn ferrocenylcarbonylpentadecanethiol monolayer gold wetting
- IT Valves
(micrometer-scale., electrochem., ferrocenylcarbonylpentadecanethiol self-assembled monolayers on gold as, for flow control of liqs. on **surfaces**)
- IT 2917-26-2, 1-Hexadecanethiol
RL: PRP (Properties)
(self-assembled monolayers, on gold, potential-dependent wetting and micrometer-scale gates for liquid flow on **surfaces** in relation to)
- L379 ANSWER 97 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1994:222481 Document No. 120:222481 Manufacture of membrane-electrode assemblies for electrochemical cells and manufactured assemblies. Swathirajan, Sundararajan; Mikhail, Youssef M. (General Motors Corp., USA). Can. Pat. Appl. CA 2081063 AA 19931004, 49 pp. (English). CODEN: CPXXEB. APPLICATION: CA 1992-2081063 19921021. PRIORITY: US 1992-862691 19920403.
- AB A combination, unitary, membrane **electrolyte** and electrode assembly is provided with a solid polymer **electrolyte** membrane, and 1st and 2nd electrodes at least partly embedded in opposed **surfaces** of the membrane. Each electrode comprises a resp. group of finely divided C particles, very finely divided catalytic particles **supported** on internal and external **surfaces** of these particles, and a **proton-conductive** material mixed with the catalytic and C particles. A 1st group of finely divided C particles forming the 1st electrode has greater H₂O attraction and retention properties and is relatively more hydrophilic and less hydrophobic than a 2nd group of C particles forming the 2nd electrode. In a preferred version, the membrane electrode assembly of the invention is prepared by forming a slurry of **proton-conductive** material and ≥1 group of finely divided C particles and very finely divided catalytic particles **supported** on and in the carbon particles. The slurry is applied to the opposed **surfaces** of the membrane, and heated while being pressed to the membrane for a sufficient time and at a **temperature** and compressive load sufficient to embed at least a portion of the particles into the membrane to form the assembly. The invention is applicable to **fuel cells** and electrochem. cells in general.
- IC ICM H01M004-96
ICS H01M008-10; H01M004-88
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72
- ST **electrolyte** electrode assembly electrochem cell; **fuel cell electrolyte** electrode assembly; polymer **electrolyte** membrane electrode assembly; carbon particle electrode **electrolyte** assembly
- IT **Fuel-cell electrolytes**
(polymer membrane, assembly of electrodes and, manufacture of)
- IT Electrodes
(**fuel-cell**, in assembly with polymer membrane)

electrolyte, manufacture of)

L379 ANSWER 98 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1994:81684 Document No. 120:81684 γ -Lithium aluminate and its manufacture for molten carbonate **fuel-cell electrolyte** matrixes. Yamazaki, Nobuyuki; Negishi, Katsuyuki (Nippon Chemical Ind, Japan). Jpn. Kokai Tokkyo Koho JP 05294614 A2 19931109 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-131620 19920423.

AB The γ -Li aluminate is a fine powder with 1st particle average maximum diameter 0.5 μm , round shape, and BET sp. **surface area** $\geq 5 \text{ m}^2/\text{g}$. The product is manufactured from fine powdered alumina with BET sp. **surface area** $\geq 10 \text{ m}^2/\text{g}$ and Li_2CO_3 with average particle diameter $\leq 10 \mu\text{m}$ by mixing uniformly and heating at $\geq 800^\circ$. The product shows high sp. **surface area**, heat **resistance**, and low water absorption.

IC ICM C01F007-04

ICS H01M008-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium aluminate **electrolyte fuel cell**

IT **Fuel-cell electrolytes**

(matrixes, γ -lithium aluminate manufacture for, for molten-carbonate **fuel cells**)

IT 554-13-2, Lithium carbonate

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of, with alumina, γ -lithium aluminate from, for **fuel-cell electrolyte matrix**)

IT 1344-28-1, Alumina, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)

(reaction of, with lithium carbonate, γ -lithium aluminate from, for **fuel-cell electrolyte matrix**)

IT 37220-89-6P, Lithium aluminate

RL: PREP (Preparation)

(γ -, **electrolyte matrix**, for molten-carbonate **fuel cells**, manufacture of)

L379 ANSWER 99 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1994:58561 Document No. 120:58561 Secondary **hydride** batteries with storage stability and low-self discharge. Fukunaga, Hiroshi (Hitachi Maxell, Japan). Jpn. Kokai Tokkyo Koho JP 05258748 A2 19931008 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-89598 19920313.

AB The batteries comprise NiO or $\text{Ni}(\text{OH})_2$ -containing cathodes, H-absorbing alloy anodes **supported** with anionic surfactants on their **surfaces**, and aqueous alkali electrolytes. Preferably, the amts. of the surfactants are 0.01-0.1% to the H-absorbing alloys.

IC ICM H01M004-24

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 46

IT 2991-51-7, FC 129

RL: USES (Uses)

(**anionic** surfactants, in hydrogen-absorbing alloy anodes for batteries)

L379 ANSWER 100 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1994:40365 Document No. 120:40365 Studies on **proton conducting** ceramics based on perovskite-type oxides. Iwahara, Hiroyasu; Hibino, Takashi; Yajima, Tamotsu (Sch. Eng., Nagoya Univ., Nagoya, 464-01, Japan). Nippon Kagaku Kaishi (9), 1003-11 (Japanese) 1993. CODEN: NKAKB8. ISSN: 0369-4577.

AB Good **proton conducting** solids usable at high **temperature** are applicable to a solid **electrolyte** for high **electrolytic** current devices like a **fuel**

cell, an electrolyzer for hydrogen production, a hydrogen separator. etc., as well as for a high temperature-type chemical sensor. Such materials had been scarcely known until oxide ceramics which have appreciable **protonic conduction** under hydrogen-containing atmospheric at high temperature were found. They are perovskite-type oxides based on SrCeO_3 or BaCeO_3 in which some trivalent cations are partially substituted for cerium. $\text{SrCe}_{0.95}\text{Yb}_{0.05}\text{O}_{3-\alpha}$, $\text{BaCe}_{0.9}\text{Nd}_{0.1}\text{O}_{3-\alpha}$, etc., belong to this class of **conductors**. Later, some zirconate-base sintered oxides also are **proton conductors** under hydrogen containing atmospheric at high temperature. These oxide ceramics exhibit p-type electronic conduction in an atmospheric free from hydrogen or water vapor. However, when water vapor or hydrogen is introduced to the atmospheric at high temperature, electronic conductivity decreases and **protonic conduction** appears. When the ceramics are exposed to the hydrogen gas, they become almost pure **protonic conductors**, the conductivities of which are multi 10^{-2} S cm^{-1} at 1000° and multi 10^{-3} S cm^{-1} at 600° . **Protonic conduction** in these solids could be verified by electrochem. permeation of hydrogen across the ceramics. These oxides are unique **ionic conductors** in respect that they have no host constituents which liberate conducting ion (proton). Using these ceramics as a solid **electrolyte**, several types of electrochem. devices were demonstrated by way of experiment. Based on the principle of hydrogen concentration cell, hydrogen sensors have put to practical use for molten aluminum in casting process.

IT 131960-38-8D, Strontium yttrium zirconium oxide
($\text{SrY}_{0.05}\text{Zr}_{0.95}\text{O}_3$), oxygen-deficient
RL: PRP (Properties)
(elec. conductivity of, in hydrogen, hydrogen electrochem. evolution in relation to)
RN 131960-38-8 HCAPLUS
CN Strontium yttrium zirconium oxide ($\text{SrY}_{0.05}\text{Zr}_{0.95}\text{O}_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	3	17778-80-2
Zr	0.95	7440-67-7
Y	0.05	7440-65-5
Sr	1	7440-24-6

CC 72-2 (Electrochemistry)
Section cross-reference(s): 52, 56, 57, 75, 76
ST hydrogen electroevolution perovskite oxide; cond perovskite oxide
proton conductor; crystal structure barium rare earth oxide
IT Rare earth **metals**, compounds
RL: PRP (Properties)
(barium oxides, lattice parameters and proton transport number for)
IT Electric conductivity and conduction
Electric conductors
(ionic, of perovskite-type oxides, by protons)
IT 110687-91-7D, Cerium strontium ytterbium oxide ($\text{Ce}_{0.95}\text{SrYb}_{0.05}\text{O}_3$), oxygen-deficient 112235-03-7D, Barium cerium neodymium oxide $\text{BaCe}_{0.9}\text{Nd}_{0.1}\text{O}_3$, oxygen-deficient 131960-38-8D, Strontium yttrium zirconium oxide ($\text{SrY}_{0.05}\text{Zr}_{0.95}\text{O}_3$), oxygen-deficient 142107-79-7D, Calcium indium zirconium oxide ($\text{CaIn}_{0.1}\text{Zr}_{0.9}\text{O}_3$), oxygen-deficient
RL: PRP (Properties)
(elec. conductivity of, in hydrogen, hydrogen electrochem. evolution in relation to)
IT 1333-74-0P, Hydrogen, preparation
RL: PREP (Preparation)

(evolution of, electrochem., perovskite-type oxide **proton conducting** electrolytes for)

L379 ANSWER 101 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1993:156618 Document No. 118:156618 Use of electrochemical techniques to study the thermodynamic and kinetic properties of **palladium-hydrogen** and **palladium-lithium-hydrogen** systems. Falanga, A. (Cent. Doct. Armement, Dir. Rech., Paris, Fr.). Report, Order No. PB91-199323, 51 pp. Avail. NTIS From: Gov. Rep. Announce. Index (U. S.) 1991, 92(2), Abstr. No. 202,564 (French) 1991.

AB The development is described of a **fuel cell** adapted to the study of **hydride** properties near room **temperature** for application to research on the thermodyn. and kinetics properties of **Pd-H** and **Pd-Li-H** systems. Besides the design of the cell itself, the effect of **electrolyte** purity, the **surface** condition and **metallurgical** structure of the material under study, and its previous activation under H were studied. The electrochem. techniques were extended to higher **temps.** (400°) using LiCl-KCl eutectic mixts. and applied to the study of **metal hydrides** and **Pd/Li**. When the material under study and the **electrolyte** are correctly coupled, electrochem. methods provide highly useful information on the thermodyn. and transport properties of different systems. The titration curves, kinetics properties, and H chemical-diffusion coeffs. of **Pd-H** and **Pd-Li-H** systems were all obtained. The advantages of electrochem. techniques over conventional ones include easier use and more rapid results, the ability to explore a broader pressure area with the same equipment, greater sensitivity to low H concns., and nearly simultaneous determination of thermodyn. and kinetics properties.

IT 7440-05-3, **Palladium**, properties

RL: PRP (Properties)

(thermodn. and kinetics properties of, in system with hydrogen and without lithium, electrochem. technique in study of)

RN 7440-05-3 HCAPLUS

CN **Palladium** (8CI, 9CI) (CA INDEX NAME)

Pd

CC 72-2 (Electrochemistry)

Section cross-reference(s): 52, 56, 65, 67, 68, 69

ST thermodyn kinetic property electrochem technique study; hydrogen **palladium** system thermodyn kinetic property; fuel cell **hydride** property; lithium potassium chloride electrochem technique **hydride**

IT Fuel cells

(**hydride** properties in relation to)

IT Diffusion

(of hydrogen in **palladium-hydrogen** and **palladium-lithium-hydrogen** systems)

IT Thermodynamics

(of **palladium-hydrogen** and **palladium** -lithium-hydrogen systems, electrochem. techniques in study of)

IT 7439-93-2, **Lithium**, properties

RL: PRP (Properties)

(thermodn. and kinetics properties of **palladium** system with hydrogen and, electrochem. technique in study of)

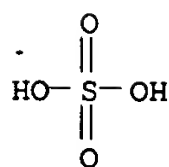
IT 1333-74-0, **Hydrogen**, properties

RL: PRP (Properties)

(thermodn. and kinetics properties of **palladium** system with, with and without lithium, electrochem. study of)

IT 7447-40-7, **Potassium chloride**, properties

- RL: PRP (Properties)
(thermodn. and kinetics properties of **palladium**
-hydrogen and **palladium**-lithium-hydrogen systems in
lithium chloride eutectic with, electrochem. techniques in study
of)
- IT 7447-41-8, Lithium chloride, properties
RL: PRP (Properties)
(thermodn. and kinetics properties of **palladium**
-hydrogen and **palladium**-lithium-hydrogen systems in
potassium chloride eutectic with, electrochem. techniques in
study of)
- IT 12648-42-9, **Palladium hydride**
RL: PRP (Properties)
(thermodn. and kinetics properties of, electrochem. technique in
study of)
- IT 7440-05-3, **Palladium**, properties
RL: PRP (Properties)
(thermodn. and kinetics properties of, in system with hydrogen
and without lithium, electrochem. technique in study of)
- L379 ANSWER 102 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1992:580493 Document No. 117:180493 Electroactive
hexaammineruthenium(3+) gallery cations in clay-modified electrodes.
Kaviratna, P. de S.; Pinnavaia, Thomas J. (Cent. Fundam. Mater.
Res., Michigan State Univ., East Lansing, MI, 48824, USA). Journal
of Electroanalytical Chemistry, 332(1-2), 135-45 (English) 1992.
CODEN: JECHES.
- AB Ru(NH₃)₆³⁺-laponite and -montmorillonite films **supported**
on graphite electrodes exhibited cyclic voltammograms with a
well-defined Ru(NH₃)₆^{3+/2+} wave even when the complex ion loading
was less than the cation exchange capacity of the clay film.
Coulometry indicated that >80% of the Ru(NH₃)₆³⁺ electrostatically
bound at the cation exchange sites of the gallery **surfaces**
was electroactive. Further confirmation of the presence of
electroactive gallery exchange cations was obtained by comparing the
electrochem. behavior of the Ru(NH₃)₆³⁺ montmorillonite with
montmorillonite containing Fe(bpy)₃²⁺ (2,2'-bipyridine) exchange ions
and [Fe(bpy)₃²⁺][SO₄²⁻] ion pairs. In this latter system, the
ion-paired [Fe(bpy)₃²⁺][SO₄²⁻] centers are electroactive, but the
gallery Fe(bpy)₃²⁺ exchange cations are rigorously electroinactive.
The concentration and nature of the cation in the **supporting**
electrolyte greatly affected the peak currents of the Ru(NH₃)₆³⁺
clay, whereas the electroactivity of the [Fe(bpy)₃²⁺][SO₄²⁻] centers
were not affected by the electrolyte cation. The decrease in the
electroactivity of Ru(NH₃)₆³⁺ montmorillonite with increasing
electrolyte concentration was attributable to the exchange of Ru(NH₃)₆³⁺ by
electrolyte cations. A mechanism is suggested for maintaining elec.
neutrality upon electron transfer in these clay films.
- IT 10294-54-9, Dicesium sulfate
RL: PRP (Properties)
(**supporting** electrolyte, depletion of electroactivity
for hexaammineruthenium gallery cation-montmorillonite electrodes
immersed in solns. of)
- RN 10294-54-9 HCAPLUS
CN Sulfuric acid, dicesium salt (8CI, 9CI) (CA INDEX NAME)



●2 Cs

- CC 72-2 (Electrochemistry)
Section cross-reference(s): 67
- IT Anodes
(**fuel-cell**, montmorillonite-modified graphite
with electroactive hexaammineruthenium gallery cations)
- IT 19052-44-9, Hexaammineruthenium ion(2+)
RL: PRP (Properties)
(redox couple containing, clay-**supported**)
- IT 7488-54-2, Dirubidium sulfate 7778-80-5, Dipotassium sulfate,
properties 10294-54-9, Dicesium sulfate 10377-48-7,
Dilithium sulfate
RL: PRP (Properties)
(**supporting** electrolyte, depletion of electroactivity
for hexaammineruthenium gallery cation-montmorillonite electrodes
immersed in solns. of)
- IT 7757-82-6, Disodium sulfate, uses
RL: USES (Uses)
(**supporting** electrolyte, in modifying graphite
electrodes with clays and electroactive gallery cations)
- IT 127-09-3, Sodium acetate
RL: PRP (Properties)
(**supporting** electrolyte, in modifying graphite
electrodes with clays and electroactive gallery cations)

L379 ANSWER 103 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1992:87676 Document No. 116:87676 Gas-diffusion electrode assembly for
use in electrochemical cells. Allen, Robert J. (Metallgesellschaft
A.-G., Germany). U.S. US 5047133 A 19910910, 7 pp. Cont. of U.S.
Ser. No. 315,936, abandoned. (English). CODEN: USXXAM.
APPLICATION: US 1990-545761 19900628. PRIORITY: US 1989-315936
19890227.

- AB The plenum-free gas-diffusion electrode assembly comprises a
catalyzed C cloth or paper **sheet** contacting a solid
metal-supported current collector **sheet**
on 1 **side** (e.g., using a conductive adhesive) and an
electrolyte-permeable aqueous polymeric hydrogel **coating**
on the other **side**, with the current collector
sheet provided with gas inlet openings (e.g., for H, O, or
air) occupying a minor portion of the **surface** of the
current collector **sheet**. The **metal**
support (especially Pb or Pb alloy) comprises a flat
surface containing a rectilinear narrow gas supply groove
extending along 1 edge and opening at the **surface**, a
supply passage opening through another edge into 1 end of the supply
groove, a rectilinear narrow discharge groove extending along an
opposite edge of the **support** and opening at the
surface, and an outlet opening through an edge of the
support into the end of the discharge groove. The openings
occupy a minor portion of the **surface**. The electrode is
used in aqueous solns. for **metals** recovery, **fuel**
cells, batteries, chlorine/alkali cells, and other
electrochem. cells.
- IT 7440-22-4, Silver, uses
RL: USES (Uses)

(conductive particles, adhesives containing, for gas-diffusion electrodes)
RN 7440-22-4 HCAPLUS
CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

IT 7440-50-8P, Copper, preparation
RL: PREP (Preparation)
(recovery of, by electrowinning, hydrogen electrodes for)
RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM C25B011-02
ICS C25C007-00
INCL 204258000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 54, 72
IT Metals, preparation
RL: PREP (Preparation)
(recovery of, by electrowinning, hydrogen electrodes for)
IT Lead alloy, base
RL: DEV (Device component use); USES (Uses)
(support, in gas-diffusion electrodes)
IT 7440-22-4, Silver, uses 7782-42-5, Graphite, uses
RL: USES (Uses)
(conductive particles, adhesives containing, for gas-diffusion electrodes)
IT 1333-74-0, Hydrogen, uses
RL: USES (Uses)
(electrodes, in recovery of metals by electrowinning)
IT 7439-96-5P, Manganese, preparation 7440-43-9P, Cadmium, preparation 7440-50-8P, Copper, preparation 7440-66-6P, Zinc, preparation
RL: PREP (Preparation)
(recovery of, by electrowinning, hydrogen electrodes for)
IT 7439-92-1, Lead, uses
RL: USES (Uses)
(support, in gas-diffusion electrodes)
IT 138985-98-5
RL: DEV (Device component use); USES (Uses)
(support, in gas-diffusion electrodes)

L379 ANSWER 104 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1992:44143 Document No. 116:44143 Unit cells for solid-electrolyte fuel cells. Fushimi, Kazuo; Kitakizaki, Kaoru; Kawakami, Kazuhiko (Neidensha Corp., Japan). Jpn. Kokai Tokkyo Koho JP 03176966 A2 19910731 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1989-315990 19891205.

AB The cells have successive layers of a perovskite-type O cathode, a 10-20 .mu.m La fluoride solid electrolyte, and group VII metal H anode deposited on a porous metal support. The cells can be operated at 200-500°.

IT 7440-02-0, Nickel, uses
RL: USES (Uses)
(anodes, for solid-electrolyte fuel cells)
RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M008-02
ICS H01M004-86; H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 76
ST solid electrolyte fuel cell;
lanthanum fluoride electrolyte fuel
cell; perovskite oxygen cathode fuel cell
; Group VII hydrogen anode fuel cell
IT Fuel-cell electrolytes
(lanthanum fluoride, for low-temperature operation)
IT Cathodes
(fuel-cell, cobalt lanthanum
strontium oxide, for low-temperature operation)
IT Anodes
(fuel-cell, nickel, for low-
temperature operation)
IT Fuel cells
(solid-state, low temperature operable)
IT 7440-02-0, Nickel, uses
RL: USES (Uses)
(anodes, for solid-electrolyte fuel
cells)
IT 110620-52-5, Cobalt lanthanum strontium oxide
(CoLa0.6Sr0.4O3)
RL: USES (Uses)
(cathode, for solid-electrolyte fuel
cells)
IT 1314-11-0
RL: USES (Uses)
(cathodes, fuel-cell, cobalt
lanthanum strontium oxide, for low-temperature
operation)
IT 13709-38-1, Lanthanum trifluoride
RL: USES (Uses)
(electrolyte, for fuel cells)
IT 11134-23-9, SUS316L
RL: USES (Uses)
(fuel cells with porous support of,
solid-electrolyte)

L379 ANSWER 105 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1991:535567 Document No. 115:135567 Process for preparation of partial
oxidation products of alicyclic compounds in oxygen-hydrogen
fuel cell-type reactor. Otsuka, Kyoshi; Yamanaka,
Ichiro (Mitsui Toatsu Chemicals, Inc., Japan). Jpn. Kokai Tokkyo
Koho JP 03123746 A2 19910527 Heisei, 7 pp. (Japanese). CODEN:
JKXXAF. APPLICATION: JP 1989-261494 19891006.
AB Alicyclic compds., i.e. alicyclic alcs. and ketones, are prepared by
contacting one catalytic electrode (cathode) with a H-donor, i.e. H,
and the other catalytic electrode (anode) with O and an alicyclic
compound in a fuel cell system using an
ion conductor (illustration given). The catalytic
electrode preferably comprises ≥ 1 metal component
or elec. conducting material selected from Group 1-8A and 1-6B
metals or metal compds., i.e. metal
halides, nitrates, sulfates, oxides, hydroxides, phosphates, or
ammonium salts. The process simultaneously can generate
elec. power. Thus, 40 mL cyclohexane was placed in the cathode
chamber of a fuel cell-type reactor having a
sheet of an anode which is formed by hot-pressing Pt black powder,

graphite powder, and teflon powder, and a sheet of a cathode similarly prepared from Pd black, graphite powder, and teflon powder, while separating the electrodes by a silica wool disk impregnated with 85% aqueous H₃PO₄ which serves as an **ion conductor**. The cathode and anode were connected by an conducting wire to form a closed circuit and to the cathode chamber O at 10 mL/min was introduced while to the anode chamber H containing 2.67 volume % H₂O at 21 mL/min was fed to give, after 20 h at 25°, 5.8 µmol cyclohexanol and 10.2 µmol cyclohexanone with 4.30 mF elec. current generated.

IT 7772-99-8, Tin(II) chloride, uses and miscellaneous
 RL: USES (Uses)
 (cathode containing graphite and palladium and, for electrochem. oxidation of cyclohexane in **fuel cell** reactor)
 RN 7772-99-8 HCAPLUS
 CN Tin chloride (SnCl₂) (8CI, 9CI) (CA INDEX NAME)

Cl-Sn-Cl

IT 7440-05-3, Palladium, uses and miscellaneous
 RL: USES (Uses)
 (cathode containing graphite and, for electrochem. oxidation of cyclohexane in **fuel cell** reactor)
 RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM C07C027-12
 ICS B01J035-02; C07C029-50; C07C035-08; C07C045-33; C07C049-403; C25B005-00; H01M004-90; H01M008-22
 ICA B01J027-10; B01J027-24; C07B061-00
 CC 24-5 (Alicyclic Compounds)
 Section cross-reference(s): 72
 ST alicyclic compd electrochem oxidn; **fuel cell** reactor electrochem oxidn; cycloalkane electrochem oxidn; cyclohexane electrochem oxidn
 IT Rare earth chlorides
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (cathodes containing palladium and graphite and, for electrochem. oxidation of cyclohexane on **fuel cell** reactor)
 IT **Fuel cells**
 (electrochem. oxidation by, of alicyclic compds. to alicyclic alcs. and ketones)
 IT Alicyclic compounds
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (electrochem. oxidation of, to alicyclic alcs. and ketones, in **fuel cell**-type reactor)
 IT Oxidation, electrochemical
 (of alicyclic compds. to alicyclic alcs. and ketones, in **fuel cell**-type reactor)
 IT Alcohols, preparation
 Ketones, preparation
 RL: SPN (Synthetic preparation); PREP (Preparation)
 (alicyclic, preparation of, by electrochem. oxidation of alicyclic compds. using **fuel cell**-type electrodes)
 IT 7440-06-4, Platinum, uses and miscellaneous
 RL: USES (Uses)
 (anode containing graphite and, for electrochem. oxidation of cyclohexane in **fuel cell** reactor)
 IT 7447-39-4, Copper(II) chloride, uses and miscellaneous 7447-40-7, Potassium chloride, uses and miscellaneous 7447-41-8, Lithium

- chloride, uses and miscellaneous 7646-79-9, Cobalt(II) chloride, uses and miscellaneous 7646-85-7, Zinc(II) chloride, uses and miscellaneous 7647-14-5, Sodium chloride, uses and miscellaneous 7647-17-8, Cesium chloride, uses and miscellaneous 7705-08-0, Iron(III) chloride, uses and miscellaneous 7718-54-9, Nickel chloride, uses and miscellaneous 7772-99-8, Tin(II) chloride, uses and miscellaneous 7773-01-5, Manganese chloride 7786-30-3, Magnesium chloride, uses and miscellaneous 7790-86-5, Cerium chloride 7791-11-9, Rubidium chloride, uses and miscellaneous 7803-55-6 10024-93-8, Neodymium chloride 10025-74-8, Dysprosium chloride 10025-76-0, Europium chloride 10042-88-3, Terbium chloride 10043-52-4, Calcium chloride, uses and miscellaneous 10049-08-8, Ruthenium(III) chloride 10099-58-8, Lanthanum chloride 10099-66-8, Lutetium chloride 10138-41-7, Erbium chloride 10138-52-0, Gadolinium chloride 10138-62-2, Holmium chloride 10361-37-2, Barium chloride, uses and miscellaneous 10361-79-2, Praseodymium chloride 10361-82-7, Samarium chloride 10361-84-9, Scandium chloride 10361-91-8, Ytterbium chloride 10361-92-9, Yttrium chloride 10476-85-4, Strontium chloride 12027-67-7 13537-18-3, Thulium chloride 16903-35-8
- RL: USES (Uses)
(cathode containing graphite and palladium and, for electrochem. oxidation of cyclohexane in **fuel cell** reactor)
- IT 7440-05-3, Palladium, uses and miscellaneous
RL: USES (Uses)
(cathode containing graphite and, for electrochem. oxidation of cyclohexane in **fuel cell** reactor)
- IT 7782-44-7, Oxygen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of alicyclic compds. with hydrogen and, in **fuel cell**-type reactor)
- IT 1333-74-0, Hydrogen, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of alicyclic compds. with oxygen and, in **fuel cell** reactor)
- IT 110-82-7, Cyclohexane, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(electrochem. oxidation of, to cyclohexanol and cyclohexanone, in **fuel cell** reactor)
- IT 108-93-0P, Cyclohexanol, preparation 108-94-1P, Cyclohexanone, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of, by electrochem. oxidation of cyclohexane, in **fuel cell**-type reactor)

L379 ANSWER 106 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1989:636622 Document No. 111:236622 **Proton-conductive** solid electrolyte. Makino, Tasuke; Matsuhira, Yasushi (Nippondenso Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 01087510 A2 19890331 Heisei, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1987-245269 19870929.

- AB The title **electrolyte** is a BaO-Ce oxide-based compound oxide containing ≥ 1 oxide of Y, Sc, Yb, Nd, Mg, Pr, and Zn with part of Ce substituted by an element having a bonding strength to O ion weaker than Ce. The element can be Zr, Ti, Hf, Si, Ge, Pb, and/or Sn. Thus, $\text{BaCe}_{0.8}\text{Zr}_{0.1}\text{Nd}_{0.1}\text{O}_{3-x}$ was prepared by sintering a mixture of BaCO_3 , CeO_2 , ZrO_2 , and Nd_2O_3 . This **electrolyte** showed high conductivity with low-temperature dependence at 670-870°. The **electrolyte** can be used for **fuel cells** and sensors.
- IT 123998-55-0D, Barium cerium neodymium zirconium oxide ($\text{BaCe}_{0.8}\text{Nd}_{0.1}\text{Zr}_{0.1}\text{O}_3$), oxygen-deficient
RL: USES (Uses)
(**electrolyte, proton-conductive, for fuel cells and sensors**)

RN 123998-55-0 HCAPLUS
 CN Barium cerium neodymium zirconium oxide (BaCe0.8Nd0.1Zr0.1O3) (9CI)
 (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O	3	17778-80-2
Zr	0.1	7440-67-7
Ce	0.8	7440-45-1
Ba	1	7440-39-3
Nd	0.1	7440-00-8

IC ICM C01B035-00
 ICS C01F017-00; H01B001-08
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72
 ST **proton conductive** solid oxide
electrolyte; barium cerium oxide solid **electrolyte**
 ; zirconium barium cerium oxide **electrolyte**; neodymium
 barium cerium oxide **electrolyte**; **fuel**
cell solid oxide **electrolyte**; electrochem sensor
 solid oxide **electrolyte**
 IT **Fuel cells**
 (solid **electrolytes** for, barium cerium oxide-based
proton-conductive)
 IT 123998-55-0D, Barium cerium neodymium zirconium oxide
 (BaCe0.8Nd0.1Zr0.1O3), oxygen-deficient
 RL: USES (Uses)
 (**electrolyte, proton-conductive,**
for fuel cells and sensors)
 IT 1309-48-4, Magnesium oxide (MgO), uses and miscellaneous
 1310-53-8, Germanium oxide (GeO2), uses and miscellaneous
 1313-97-9, Neodymium oxide (Nd2O3) 1314-13-2, Zinc oxide (ZnO),
 uses and miscellaneous 1314-23-4, Zirconium oxide (ZrO2), uses and
 miscellaneous 1314-36-9, Yttrium oxide (Y2O3), uses and
 miscellaneous 1314-37-0, Ytterbium oxide (Yb2O3) 1332-29-2, Tin
 oxide 1335-25-7, Lead oxide 7631-86-9, Silica, uses and
 miscellaneous 12036-32-7, Praseodymium oxide (Pr2O3) 12055-23-1,
 Hafnium oxide (HfO2) 13463-67-7, Titanium oxide (TiO2), uses and
 miscellaneous 37200-34-3, Scandium oxide
 RL: USES (Uses)
 (solid **electrolytes** containing, barium cerium oxide-based
proton-conductive, for fuel
cells and sensors)

L379 ANSWER 107 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1989:617218 Document No. 111:217218 Anodes for high-
temperature fuel cells. Hado, Kazuhito; Niikura, Junji;
 Taniguchi, Noboru; Gamo, Koji; Moriwaki, Yoshio; Iwaki, Tsutomu
 (Matsushita Electric Industrial Co., Ltd., Japan). Jpn. Kokai
 Tokkyo Koho JP 01167957 A2 19890703 Heisei, 3 pp. (Japanese).
 CODEN: JKXXAF. APPLICATION: JP 1987-328545 19871224.

AB H-absorbing alloy or **metal hydrides** containing Zr
 are used as the anodes. The anodes may contain Ni, or
 ≥1 of **Ti, V, Cr, Mn, Fe**
 , Co, Cu, Nb, Mo, W, Al, Mg, Ca and Sr. The anodes may be
coated with **Ni, Cu, Al, Cr,**
 Co, Pd, and/or Pt, or with ceramics. High performance of
fuel cells is obtained. Thus, Zr-Cu
 alloy was pulverized, **coated** with **Ni**, mixed with
Ni carbonyl, pressed and heated to working **temperature**
 A **fuel cell** using this anode, Li-doped
Ni oxide as cathode, and 62:38 (mol ratio) Li2CO3-K2CO3
 mixture as **electrolyte** was operated at 650° and
 showed excellent performance.

IT 7439-89-6, Iron, uses and miscellaneous
7440-02-0, Nickel, uses and miscellaneous
7440-32-6, Titanium, uses and miscellaneous
7440-47-3, Chromium, uses and miscellaneous
7440-50-8, Copper, uses and miscellaneous
7440-62-2, Vanadium, uses and miscellaneous
RL: DEV (Device component use); USES (Uses)
(anodes containing, for high-temperature hydrogen fuel cells)
RN 7439-89-6 HCAPLUS
CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS
CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-32-6 HCAPLUS
CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCAPLUS
CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

RN 7440-50-8 HCAPLUS
CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

RN 7440-62-2 HCAPLUS
CN Vanadium (8CI, 9CI) (CA INDEX NAME)

V

IT 7440-05-3, Palladium, uses and miscellaneous
RL: USES (Uses)
(coatings, on anodes for high-temperature hydrogen
fuel cells)
RN 7440-05-3 HCAPLUS
CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC ICM H01M004-86
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST hydrogen fuel cell high temp; zirconium alloy fuel cell
anode
IT Ceramic materials and wares

(coatings, on anodes for high-temperature hydrogen fuel cells)

IT Anodes
(fuel-cell, zirconium alloys and metal hydrides, for high-temperature hydrogen fuel cells)

IT 7429-90-5, Aluminum, uses and miscellaneous 7439-89-6, Iron, uses and miscellaneous 7439-95-4, Magnesium, uses and miscellaneous 7439-96-5, Manganese, uses and miscellaneous 7439-98-7, Molybdenum, uses and miscellaneous 7440-02-0, Nickel, uses and miscellaneous 7440-03-1, Niobium, uses and miscellaneous 7440-24-6, Strontium, uses and miscellaneous 7440-32-6, Titanium, uses and miscellaneous 7440-33-7, Tungsten, uses and miscellaneous 7440-47-3, Chromium, uses and miscellaneous 7440-48-4, Cobalt, uses and miscellaneous 7440-50-8, Copper, uses and miscellaneous 7440-62-2, Vanadium, uses and miscellaneous 7440-70-2, Calcium, uses and miscellaneous 11101-28-3
RL: DEV (Device component use); USES (Uses)
(anodes containing, for high-temperature hydrogen fuel cells)

IT 11134-36-4
RL: USES (Uses)
(anodes, hydrogen-absorbing, nickel in, for high-temperature hydrogen fuel cells)

IT 123697-77-8
RL: USES (Uses)
(anodes, hydrogen-absorbing, nickel-copper alloys in, for high-temperature hydrogen fuel cells)

IT 7440-05-3, Palladium, uses and miscellaneous 7440-06-4, Platinum, uses and miscellaneous
RL: USES (Uses)
(coatings, on anodes for high-temperature hydrogen fuel cells)

L379 ANSWER 108 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
1981:211497 Document No. 94:211497 **Metal hydride**
fuel cells: a feasibility study and perspectives for vehicular applications. Folonari, C.; Iemmi, G.; Manfredi, F.; Rolle, A. (FIAT Res. Cent., Turin, Italy). Journal of the Less-Common Metals, 74(2), 371-8 (English) 1980. CODEN: JCOMAH. ISSN: 0022-5088.

AB Several alloys of the **LaNi₅** [12196-72-4] family were tested to evaluate their thermochem. and electrochem. properties using repeated H absorption-desorption cycling. The alloys show good electrochem. properties, fast discharging and recharging kinetics, and high H absorption. On the basis of exptl. results and theor. evaluations, the realization of new types of **fuel cells** characterized by **hydride** electrodes and a solid **electrolyte** is tech. feasible. In addition to the advantages of conventional **fuel cells**, a compact simple structure with a high energy d. can be obtained; the application of this structure to the propulsion of elec. vehicles could product significant improvements in reliability and performance compared with conventional and advanced secondary batteries.

IT 12196-72-4
RL: DEV (Device component use); USES (Uses)
(for anodes, fuel-cell, properties of)

RN 12196-72-4 HCAPLUS
CN Lanthanum, compd. with nickel (1:5) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
Ni	5	7440-02-0
La	1	7439-91-0

GC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 56

ST **metal hydride** fuel cell; **lanthanum**
nickel hydride fuel cell

IT Fuel cells
 (metal hydride)

IT 12196-72-4 12213-73-9 62699-62-1
 RL: DEV (Device component use); USES (Uses)
 (for anodes, fuel-cell, properties of)

L379 ANSWER 109 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1971:9070 Document No. 74:9070 Manufacture of Raney
 catalyst-containing electrodes. Doetzer, Richard; Kohlmueeller, Hans
 (Siemens A.-G.). Ger. Offen. DE 1909031 19700910, 14 pp. (German).
 CODEN: GWXXBX. APPLICATION: DE 1969-1909031 19690222.

AB The invention describes the manufacture of high activity Raney catalyst
 containing electrodes for electrochem. **cells**, especially
fuel cells having reactants dissolved in the
electrolyte. Al is electrodeposited on a **metallic**
support using an **electrolyte** of the general
 formula MX_2AlR_3 , where M is a Na, K, or onium ion, X is a
 halogen or cyanide, and R is an alkyl residue containing 1-12 C atoms;
 the **temperature** is pref. 80-120°, the c.d. 1-20 mA/cm²,
 and the voltage 1.5-12 V. After deposition, a Raney
alloy is produced by diffusion at 350-650°. The
 diffused Al is removed by an aqueous solution of either an alkali
metal hydroxide or an alkyl halide. The **metallic**
support material can be in **sheet** form, porous or
 nonporous foil, porous sintered solids, or a mesh. Suitable
metals are: Ni, Co, W, Ag or their
alloys.

IT 7440-02-0, uses and miscellaneous
 RL: CAT (Catalyst use); USES (Uses)
 (catalysts, **fuel-cell**, Raney type)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 77 (Electrochemistry)

ST Raney catalysts electrodes **fuel cells**; catalysts
 Raney electrodes **fuel cells**; electrodes Raney
 catalysts **fuel cells**; **fuel**
cells Raney catalysts electrodes

IT **Fuel cells**
 (electrodes, Raney catalyst for)

IT Electrodes
 (**fuel-cell**, Raney catalyst for)

IT 7440-02-0, uses and miscellaneous 7440-48-4, uses and
 miscellaneous
 RL: CAT (Catalyst use); USES (Uses)
 (catalysts, **fuel-cell**, Raney type)

L379 ANSWER 110 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1969:497758 Document No. 71:97758 **Fuel-cell**
 electrodes. Vanleughenaghe, Claude (Societe d'Etudes, de Recherches
 et d'Applications pour l'Industries S.E.R.A.I.). Ger. Offen. DE
 1904768 19690904, 15 pp. (German). CODEN: GWXXBX. APPLICATION: DE
 1969-1904768 19690131.

AB A method is given for improving the capacity of **fuel-**
cell electrodes consisting of a mixture of C, catalyst, and
 polymeric fluorohydrocarbon binder on **metallic**
support. The electrode is treated with alkali

metals dissolved in liquid NH₃, methylamine, or naphthalene plus tetrahydrofuran. Only the side exposed to the electrolyte may be treated with alkali metal hydrides or borohydrides followed by heating at <350°. The electrode can also be treated with alkali metal vapors or melts. Thus, an electrode consisting of 200-μ film of 5.25% poly(tetrafluoroethylene) and 94.75% mixture of 8 parts active C, 10 parts Pt, and 10 parts Pd on a Ni support is immersed for 75 sec. in a solution of 400-mg. Na in 300-ml. liquid NH₃ and dried in air. An H₂-O₂ cell with 5N KOH electrolyte and the prepared electrode has a voltage of 1000-854 mv. at a c.d. 0-300 ma./cm.² at 70° as compared to 1100-826 mv. for a cell with 50% KOH electrolyte and Halderman electrode containing 40 mg. Pt/cm.² and operating at 100°.

IC H01M
 CC 77 (Electrochemistry)
 ST fuel cell electrodes; electrodes fuel cell
 IT Fuel cells
 (electrodes, Teflon-bonded, impregnated with alkali metals and calcium)
 IT Electrodes
 (fuel-cell, Teflon-bonded, impregnated with alkali metals and calcium)
 IT Alkali metals, uses and miscellaneous
 RL: USES (Uses)
 (impregnation with, of teflon bonded fuel-cell electrode)
 IT 7439-93-2, uses and miscellaneous 7440-23-5, uses and miscellaneous
 miscellaneous 7440-70-2, uses and miscellaneous
 RL: USES (Uses)
 (impregnation with, of teflon bonded fuel-cell electrode)

L379 ANSWER 111 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1969:487163 Correction of: 1969:435501 Document No. 71:87163
 Correction of: 71:35501 Electrodes for electrochemical fuel cells. (Leesona Corp.). Brit. GB 1151787 19690514, 3 pp. (English). CODEN: BRXXAA. PRIORITY: US; 19650930.

AB An O electrode for fuel cells was fabricated by coating a porous metal support (0.5-1 mm. thick, mesh size 50-150) of Ni, Cu, Fe, Ta, Zr, Au, Ag, or their alloys with a dispersion of 55-90% Co and (or) Ni or Co-activated Ni and 10-45% hydrophobic polymer [such as poly(tetrafluoroethylene), polyethylene, or polystyrene], drying in air at 50-95° under slight pressure, and sintering for 5-35 min. at 220-300°. Thus, a 100-mesh Ni screen was sprayed with a dispersion of 15% poly(tetrafluoroethylene) and 85% 1:1 Co-Ni, dried for 10 min. at 85°, and after rolling, sintered at 250° for 6 min. When used as a cathode in a half-cell with 65% KOH electrolyte and with air as fuel at 150°, the electrode voltage was 0.91-0.98 v. and c.d. 100-300 ma./cm.²

IC H01M
 CC 77 (Electrochemistry)
 ST electrodes fuel cells; fuel cells electrodes; cells fuel electrodes; oxygen electrode fuel cells
 IT Fuel cells
 (electrodes, cobalt-nickel in teflon dispersion on nickel screen)
 IT Electrodes
 (fuel-cell, oxygen, cobalt-nickel in teflon dispersion on nickel screen)

- IT 7440-48-4, uses and miscellaneous
RL: USES (Uses)
(electrodes with **nickel**, **fuel-cell**)
- IT 7782-44-7, uses and miscellaneous
RL: USES (Uses)
(electrodes, **fuel-cell**)
- IT 9002-84-0, uses and miscellaneous
RL: USES (Uses)
(in **fuel-cell** electrodes, with cobalt-
nickel mixture)

L379 ANSWER 112 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1969:466734 Document No. 71:66734 Nonstoichiometric boron carbide as a catalyst **support** for fuel-cell electrodes. (General Electric Co.). Brit. GB 1157124 19690702, 12 pp. (English).
CODEN: BRXXAA. PRIORITY: US; 19651001.

- AB C (e.g. graphite) containing dissolved B is a suitable **support** material for **fuel-cell** electrodes (especially anodes), fulfilling the requirements of being electronically conducting and of having a high resistance to electrochem. oxidation and to attack by strong acids and alkalis, and also enhancing the catalytic activity, yielding a more effective electrode than conventional **support** materials (e.g. C, Ta). The maximum solubilities of B in graphite at **temps.** .apprx.2200° are known (.apprx.2 weight % B) (R. V. Sara, et al., CA 60: 8967g); further added B combines chemical There is a greater increase in performance in material comprising B dissolved in C plus B carbide as a 2nd phase. When stoichiometric B carbide (I) (80 atomic % B) alone is used, the performance is poor. I is believed to have a unit cell of B₁₂C₃ with the B atoms at the vertices of a regular icosahedron with the C atoms as linear units of 3 atoms each. High purity I has a relatively high powder resistivity (.apprx.8000 ohm-cm.) but this decreases as the amount of C is increased, especially at and above 30 atomic % C. The superior performance of the nonstoichiometric boron carbide (II) is due to the relation between the B carbide crystals and the excess C in the form of graphite crystals containing B. One com. preparation of I and II has been described by Ridgway (CA 28: 71676). The **metal** catalyst (preferably of noble **metals** of Groups VIII and IB) is prepared by thermally decomposing a halogen-free **salt** (e.g. Pt(NH₃)₂(NO₂)₂ or AgOAc) on the **support**, to produce **metal surfaces** of area at least 20 m.²/g. A suitable **fuel cell** construction is described in Brit. 1,043,127. The electrode may be prepared by spreading a paste of catalyst-bearing II (particle size <400 mesh, i.e. able to pass through a mesh of 400 holes/lineal inch) and poly-(tetrafluoroethylene) (PTFE) powder suspended in water on a current collector mesh screen, consolidating under light pressure, and heating to 350-400°, to allow the PTFE binder to fuse the mixture into a coherent porous mass. The binder should be 10-30 weight % of the total mixture; the catalyst concentration should be 0.1-50 weight % of the **support** material. For example, 0.500 g. of 800 mesh (8-12 μ) II containing 4.8 weight % Pt was mixed with 0.96 ml. of a suspension containing 0.8 ml. of water and 0.16 ml. of a 60% solids PTFE suspension. The resulting paste was spread directly on a 17/8-in. diameter Pt screen (45 + 45 mesh, 0.0078 in. wire diameter) so that the paste extended through the screen mesh. After smoothing, the structure was fused at 350° for 2 min. A hydrophobic **film** was applied on one **side** by spraying a water-diluted PTFE suspension to form a **film** of 6 mg./cm.² and then heating at 350° for 2 min. The performances of **fuel cells** with anodes prepared as described and with standard Pt cathodes, were tested for different **support** materials and shown to be best with II containing 60%B.
- IT 7440-05-3, uses and miscellaneous
RL: CAT (Catalyst use); USES (Uses)

(catalysts, fuel-cell, in nonstoichiometric boron carbide support)

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

IC H01M
 CC 77 (Electrochemistry)
 IT Fuel cells
 (electrodes, catalytic, with nonstoichiometric boron carbide support)

IT Electrodes
 (fuel-cell, catalytic, with nonstoichiometric boron carbide support)

IT Boron carbide
 RL: PRP (Properties)
 (fuel-cell catalyst support from nonstoichiometric)

IT 7440-02-0, uses and miscellaneous 7440-05-3, uses and miscellaneous 7440-06-4, uses and miscellaneous
 RL: CAT (Catalyst use); USES (Uses)
 (catalysts, fuel-cell, in nonstoichiometric boron carbide support)

L379 ANSWER 113 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN
 1969:435501 Document No. 71:35501 Electrodes for electrochemical fuel cells. (Leesona Corp.). Brit. GB 1151787
 19690514, 3 pp. (English). CODEN: BRXXAA. PRIORITY: US; 19650930.

AB An O electrode for fuel cells was fabricated by coating a porous metal support (0.5-1 mm. thick, mesh size 50-150) of Ni, Cu, Fe, Ta, Zr, Au, Ag, or their alloys with a dispersion of 55-90% Co and (or) Ni or Co-activated Ni and 10-45% hydrophobic polymer (such as polytetrafluoroethylene, polyethylene, or polystyrene), drying in air at 50-95° under slight pressure, and sintering for 5-35 min. at 220-300°. Thus, a 100-mesh Ni screen was sprayed with a dispersion of 15% polytetrafluoroethyl-ene and 85% Co-Ni (1:1), dried for 10 min. at 85°, and after rolling, sintered at 250° for 6 min. When used as a cathode in a half-cell with 65% KOH electrolyte and with air as fuel at 150°, the electrode voltage was 0.91-0.98 v . and c.d. 100-300 ma./cm.2

IC H01M
 CC 77 (Electrochemistry)
 ST fuel cells electrodes; electrodes fuel cells; nickel fuel cells electrodes

IT Fuel cells
 (cathodes, cobalt-nickel, in tetrafluoroethylene polymer matrix)

IT Cathodes
 (fuel-cell, cobalt-nickel, in tetrafluoroethylene polymer matrix)

IT 9002-84-0, uses and miscellaneous
 RL: USES (Uses)
 (fuel-cell cathodes from cobalt-nickel and)

IT 7440-48-4, uses and miscellaneous
 RL: USES (Uses)
 (fuel-cell cathodes from nickel and, in tetrafluoroethylene polymer matrix)

L379 ANSWER 114 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1968:432509 Document No. 69:32509 Hydrogenation catalyst. Jung, Margarete; Kroeger, Hanns H. (Varta A.-G.). U.S. US 3382106 19680507, 7 pp. (English). CODEN: USXXAM. APPLICATION: US 1965-485573 19650907.

AB Catalysts useful for H transfer reactions, especially those occurring in fuel cells, are prepared by saturating with H an alkali-resistant, crystalline metal from Group IVB, VB, VIB, VIII, or Pt. The metal is impregnated with a 10-3 weight % aqueous alkaline solution of a strong reducing agent such as a complex metal hydride, hydrazine and its salts, or hydroxylamine and its salts, at 10-60°. The process is terminated when gaseous H is evolved. The process may also be used for reactivating spent catalyst. For example, 1 g. Ni powder (6-8 μ particle size) obtained by decomposing Ni carbonyl was immersed at room temp . in 0.5 ml. of a 5% solution of NaBH₄ in 4N KOH solution. The Ni darkened and increased in volume by 290%. After 22 min., gaseous H started to escape from the solution. The activated powder was placed between 2 fine sieves and inserted in a fuel cell as the neg. electrode. The cell was operated with MeOH dissolved in 6N KOH as fuel and took a load of 10 ma./sq. cm. at room temperature while a sample of unactivated powder similarly tested broke down at a load of 0.08 ma./sq. cm.

IT 7439-89-6, uses and miscellaneous 7440-02-0, uses and miscellaneous 7440-05-3, uses and miscellaneous 7440-22-4, uses and miscellaneous 7440-32-6, uses and miscellaneous 7440-47-3, uses and miscellaneous
RL: CAT (Catalyst use); USES (Uses)
(catalysts, fuel-cell and hydrogenation)

RN 7439-89-6 HCAPLUS

CN Iron (7CI, 8CI, 9CI) (CA INDEX NAME)

Fe

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-05-3 HCAPLUS

CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

RN 7440-22-4 HCAPLUS

CN Silver (8CI, 9CI) (CA INDEX NAME)

Ag

RN 7440-32-6 HCAPLUS

CN Titanium (8CI, 9CI) (CA INDEX NAME)

Ti

RN 7440-47-3 HCAPLUS

CN Chromium (8CI, 9CI) (CA INDEX NAME)

Cr

INCL 136120000

CC 77 (Electrochemistry)

ST fuel cells **H transfer**; **nickel catalyst**
H transfer; hydrogenation catalyst;
hydrogen transfer catalystIT Hydrogenation catalysts
(**metals as**, activated by hydrazine anhydride and
hydroxylamine)IT **Silver** alloys, containing
(**palladium-**, catalysts, fuel-cell and hydrogenation)IT **Palladium** alloys, base
(**silver-**, catalysts, fuel-cell and hydrogenation)IT 7439-89-6, uses and miscellaneous 7440-02-0, uses
and miscellaneous 7440-05-3, uses and miscellaneous
7440-22-4, uses and miscellaneous 7440-32-6, uses
and miscellaneous 7440-47-3, uses and miscellaneous
7440-48-4, uses and miscellaneous 7440-67-7, uses and
miscellaneousRL: CAT (Catalyst use); USES (Uses)
(catalysts, fuel-cell and hydrogenation)

L379 ANSWER 115 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1968:3603 Document No. 68:3603 **Coating** permeable membranes
with electrically conducting **metallic films**,
especially the inside of hollow fiber membranes. Levine, Charles
Arthur; Prevost, Alfred L. (Dow Chemical Co.). U.S. US 3351487
19671107, 10 pp. (English). CODEN: USXXAM. APPLICATION: US
19631106.AB Permeable membranes are plated with an elec.-conducting
metallic film by contact of 1 **side** of
the membrane with a **metal-ion** solution and the
other **side** with a reducing agent. With **cationic**
membranes, the **metal ions** permeate the membrane
and are uniformly deposited on the **surface** in contact with
the reducing agent. With **anionic** membranes, the reducing
agent permeates to cause **metal** deposition. The membranes,
which are **films** or hollow fibers, are uniformly plated
with reduced waste and are useful in **fuel cells**.
Thus, polyethylene hollow fibers (120 μ inside diameter) were
chlorosulfonated with 10% ClSO₂OH, hydrolyzed, and washed to give an
ion-exchange capacity of 1.5 meq./g. The ends of a treated
fiber bundle were potted in epoxy resin and the cast resin was
machined to expose the open fibers. The encapsulated fiber ends
were mounted in an apparatus that pumped a reducing solution through the
side of the fibers, while their exteriors were immersed in a
plating solution containing 3.5 parts AgNO₃, 3 parts H₂O, and sufficient
NH₄OH to dissolve initial precipitate. The reducing solution contained PhNHNH
1, EtOH 11, and H₂O 10 parts. After 1.5 hrs., the fiber interiors
were plated with an adherent Ag **film** that did not clog the
membrane pores and had a resistance of 15 **ohms./cm**
. The exterior **surface** resistance was 5000 **ohms**
/cm. Similar conducting membranes were prepared by plating
Ni, Cu, Pt, Pd, and Au on **film** or fiber membranes of
Nalfilm I and II, sulfonated nylon (Accropore 5A 6404 Resin), and
3:7 polyethylene-zeolite mixts. Rochelle **salt**, a
NaOH-HaSH.2H₂O-NaH₂PO₂.H₂O mixture, Na₂S₂O₄, a KOH-N₂H₄.H₂SO₄-N₂H₄.H₂O
mixture, and N₂H₄.H₂O were used as reducing agents.

IT 7440-05-3, uses and miscellaneous

RL: USES (Uses)
(**coatings** and linings of, on membranes and hollow
fibers, for fuel cells)

RN 7440-05-3 HCAPLUS
 CN Palladium (8CI, 9CI) (CA INDEX NAME)

Pd

INCL 117227000

CC 37 (Plastics Fabrication and Uses)

ST COPPER LINING PLASTIC FIBERS; GOLD LINING PLASTIC FIBERS; FUEL CELL FIBER MEMBRANES; NICKEL LINING PLASTIC FIBERS; SILVER LINING POLYETHYLENE FIBERS; **METAL COATING PERMEABLE FIBERS**; FIBERS PERMEABLE **METAL COATING**; PLATINUM LINING PLASTIC FIBERS; PERMEABLE FIBERS **METAL COATING**; PALLADIUM LINING PLASTIC FIBERS; POLYETHYLENE FIBERS **METAL LINING**

IT Membranes

(fuel-cell, from hollow fibers lined with electrically conducting films)

IT Fiber, synthetic

RL: USES (Uses)

(hollow, lined with electrically conducting **metallic films**, for membranes for fuel cells)

IT Fuel cells

(membrane for, with hollow fibers, lined with electrically conducting films)

IT **Anion** exchangers, uses and miscellaneous

(membranes, and hollow fibers therefrom, coated with electrically conducting **metallic films**, for fuel cells)

IT Lining process

(of hollow fibers with electrically conducting **metallic films**)

IT **Cation** exchangers, uses and miscellaneous

(sulfonated, membranes from hollow fibers of, lined with electrically conducting films, for fuel cells)

IT Nylon, uses and miscellaneous

RL: USES (Uses)

(sulfonated, permeable membranes from, coated with electrically conducting **metallic films**, for fuel cells)

IT 7440-02-0, uses and miscellaneous 7440-05-3, uses and miscellaneous 7440-06-4, uses and miscellaneous 7440-22-4, uses and miscellaneous 7440-50-8, uses and miscellaneous 7440-57-5, uses and miscellaneous

RL: USES (Uses)

(coatings and linings of, on membranes and hollow fibers, for fuel cells)

IT 9002-88-4, uses and miscellaneous

RL: USES (Uses)

(sulfonated, membranes from hollow fibers of, lined with electrically conducting films, for fuel cells)

L379 ANSWER 116 OF 116 HCAPLUS COPYRIGHT 2005 ACS on STN

1967:100942 Document No. 66:100942 Inorganic ion-exchange

membranes fuel cell. Berger, Carl; Strier,

Murray P. (Douglas Aircraft Co., Inc., Santa Monica, CA, USA). NASA

(Nat. Aeronaut. Space Admin.) Access., NASA-CR-54784, 177 pp.

Avail. CFSTI, \$3 hc From: Sci. Tech. Aerospace Rept. 1966, 4(6),

N66-15227 (English) 1965. CODEN: NAACAF.

AB cf. CA 65, 8326c. The most significant achievement of this program was the development of a Zr phosphate membrane impregnated with catalyst which can perform in a fuel cell at 0.77-0.78 v. at 30 ma./cm.2 This type of fuel cell can operate continuously for at least 1200 hrs. and has a capability of operating at a temp

. as high as 151°. Extrapolations of enhanced electrocatalytic activity (i.e., higher catalyst loading in the membrane) and lower membrane resistivity down to the 1 ohm-cm. level indicate that a fuel cell performance of 0.840-0.850 v. at 30 ma./cm.2 and 0.820 volts at 50 ma./cm.2 should be possible for the inorg. membrane fuel cell. What is most unusual about the membrane is its high strength and favorable conductivity and stability. The incorporation of the zeolite component is conducive particularly to the latter.

CC 77 (Electrochemistry)
IT Electrodes
 (fuel-cell, zirconium
 phosphate ion-exchanging membranes impregnated
 with catalyst)
IT Membranes
 (ion-exchanging, zirconium phosphate
 , for fuel cells)
IT Ion exchangers, uses and miscellaneous
 (membranes, from zirconium phosphate for
 fuel cells)
IT Fuel cells
 (with zirconium phosphate ion
 -exchanging membranes, impregnating with catalyst)
IT 13765-95-2
RL: PRP (Properties)
 (ion-exchange membranes from, for fuel
 cells)

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